REESTIMATION OF SHADOW PRICES FOR THE PHILIPPINES

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REESTIMATION OF SHADOW PRICES FOR THE PHILIPPINES*

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I. INTRODUCTION

In the 1960s, studies began to flourish in the field of cost- benefit analysis, particularly within the context of project evaluation. Early contributions to the literature formulated methodologies and framework for estimating social opportunity costs of goods and resources, with an underlying objective of maximizing income, regardless of its distributional impact. These earlier contributions constitute what is now referred to as the "traditional approach." Well-known proponents of this approach include Arnold Harberger and Edward Mishan.

Since then, a lot of contributions have been added to the literature. New approaches were developed, which, in contrast with the traditional view, sought to value differentially a project's distributional impact and its impact between saving and consumption. The most widely cited contributions to the new approach include Dasgupta, Marglin and Sen (1972), Little and Mirrlees (1968 and 1974) and Squire and van der Tak (1975).[1]

There are also studies on shadow prices in the Philippine context. The first and most complete set of estimates of shadow prices for the Philippines based on empirical data and analytically deduced formulas, can be found in Bautista, Power and Associates (1979). It provides estimates of shadow prices of foreign exchange (using 1974 data), labor (using 1977 data), and capital (based on 1974 data). The estimates were updated and methodologies were improved in Medalla and Power (1984).

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1. A comprehensive and critical review of issues and methodologies in cost-benefit analysis can be found in Anandarup Ray (1984).

After years of debate, the subject of cost-benefit analysis, particularly the concept of using distribution weights, remains controversial.

This study would not attempt to end the debate. It does not intend to resolve all the controversial issues in cost-benefit analysis. Rather, its objectives are much more modest. It is primarily addressed to actual practitioners of project evaluation and is thus designed to be practical. The main objectives of the study are :

1. to provide the most recent estimates of the basic parameters in shadow pricing, namely, the shadow exchange rate, the marginal productivity of capital, and the opportunity cost of labor;

2. to spell out procedures for estimating these parameters to enable convenient and consistent reestimation in the future; and

3. to clarify the differences between approaches and trace their impact on the parameters used in order to easily shift from one approach to another.

The study is divided into six parts. Part 1 gives a brief background on the topic while part II provides an overview of the concept of shadow pricing and the basic approaches to cost- benefit analysis. The succeeding parts discuss how to estimate shadow prices. In particular, part III shows how to estimate the shadow exchange rate, part IV the marginal productivity of capital and part V, the shadow wage rate. Finally, part VI discusses how to estimate accounting price ratios for frequently used (nontraded) inputs such as elecricity and transportation services.

II. CONCEPTS AND ISSUES: AN OVERVIEW

Cost-benefit analysis is based on the same analytical principles as those in other branches of applied welfare economics. Basically, it aims to weigh the impact of a project, in terms of costs and benefits, on the society's economic objectives, defined by some implicit social welfare function. Shadow pricing of a good or resource then boils down to measuring the gains or losses in welfare arising from a marginal change in its use.

The procedure seems straightforward. In practice, however, the task becomes complicated because of the difficulty in defining such a social welfare function. In addition, the costs and benefits of a project, especially a social project with intangible output, are often difficult to identify. Moreover, a project's impact would affect different individuals/sectors and occur over a time, necessitating some intratemporal and intertemporal comparisons of these costs and benefits. These difficulties are very much apparent in the new approach but are somewhat simplified in the traditional approach. A discussion of the two approaches follows.

A. *The Traditional Approach*

In the traditional approach, the implied objective function is to maximize aggregate consumption over time. In project evaluation, this requires maximizing the net present value of the stream of changes in consumption arising from the project.

A project's impact would generally be varied within, as well as across time periods. Benefits and costs would accrue to different sectors and/or individuals, and differentially over time. Two problems arise at once -- how to get the overall benefits and costs of a project (1) within any given point in time, and (2) over a longer time period.

The traditional approach overcomes the first problem by treating individuals nondifferentially and aggregating benefits and costs directly within any given time period. In other words, the marginal value of consumption for all individuals are treated equally. There is thus an implicit acceptance of the Kaldor criterion that for a project to be desirable, gainers should be able to compensate the losers, whether or not this compensation is indeed carried out. This further implicitly assumes that the government is able to redistribute income through fiscal means.

The second problem is simplified in the traditional approach by assuming that consumption and investment are equally valuable at the margin, or that if saving is sub-optimal, selecting a project is not the appropriate means to raise saving. The latter implies that the government is better able to increase saving through fiscal and monetary policies.

These assumptions under the traditional approach have broad implications on the valuation of shadow prices of goods and resources. In general, the shadow price of a good or resource would then simply be the amount of forgone output arising from a marginal withdrawal from its best alternative use.

In particular, the assumptions under the traditional approach would yield the following:

1. the shadow price of investment (along with the shadow price of saving and the shadow price of capital) equals unity;

2. the social rate of discount would be q, the marginal rate of return to investment (or the marginal productivity of capital, its opportunity cost), as this indicates the value of forgone earnings of present consumption[2]; and

2. This glosses over a number of difficulties, e.g. the existence of an imperfect capital market, the presence of multiple interest rates and others. The social rate of discount (SDR) should be the consumption rate of interest (CRI). The traditional approach takes this CRI to be reflected in the market rate of interest (MRI). Assuming that there are no distortions in the capital market, and that the economy is on its optimal growth path (as indeed is assumed by equating q above to MRI), then indeed, SPI = 1 and SDR = q.

3. the shadow wage rate is the direct opportunity cost of labor- - the marginal productivity of labor in its alternative use.

To recapitulate, the traditional approach does not assign differential weights on costs and benefits according to how they are distributed. It does not distinguish between income groups, nor between consumption and investment, public or private. The underlying objective function is to maximize aggregate consumption or its equivalent (since consumption and investment are assumed to be equally valuable), and the national income (efficiency consideration) with no explicit concern for its distribution (equity consideration).

The social rate of discount (SDR) should be the consumption rate of interest (CRI). The traditional approach takes this CRI to be reflected in the market rate of interest (MRI). Assuming that there are no distortions in the capital market, and that the economy is on its optimal growth path (as indeed is assumed by equating q above to MRI), then indeed, SPI = 1 and SDR = q. By being indifferent between consumption and investment, and as to how costs and benefits are distributed, the traditional approach nonetheless makes implicit social value judgments which proponents of the new approach find unrealistic if not unacceptable. The new approach was then developed which allows greater flexibility on the use of differential weights when desired.

B. *The Non-Traditional Approach*

The non-traditional approach to cost-benefit analysis basically uses different distributional weights for costs and benefits and places a premium on investment. Theoretically, depending on the objectives chosen, a project evaluator could distinguish among as many groupings as necessary. For example, uses of public income -- e.g. for education, health, defense, investment, etc., could be assigned different weights. Or perhaps, distinction would be made only between public investment expenditures and other public (non- investment) expenditures. Of course, a rational government would allocate its income as optimally as posible, that is, the marginal returns for each type are equated. Thus, it is expected that the valuation across the types of expenditures are uniform. In other words, public expenditure, whether for investment or "consumption", should be equally valuable. Another distinction is consumption across different income groups. Theoretically, the income grouping could be as disaggregated as possible.

The flexibility offered by the new approach should, of course, be tempered by practicability. The choice should be discriminating and guided by the incremental benefits and costs.

For illustration purposes, the discussion of the non-traditional approach is simplified by introducing the following changes in the traditional approach:

1. A distinction is made between consumption and investment. Specifically, a premium is placed on investment.

2. Variable income (consumption) distribution weights, denoted by d, are used to distinguish between income (consumption) groups.

These distinctions are the most important deviations from the traditional approach that are usually incorporated in the non- traditional approach. They also basically represent the variations typically used.

Because of the differential valuation implied by the weights, the need for a numeraire, a common yardstick for measurement, becomes imperative.

1. The Numeraire

Theoretically, the project evaluator could choose any variable as the numeraire. The choice of numeraire should not matter as long as it is used consistently throughout the evaluation.

Dasgupta, et al. (UNIDO Guidelines) use consumption (specifically, average consumption) as numeraire. Little and Mirrlees prefer to use uncommitted public income, freely convertible to foreign exchange. Squire and van der Tak use also public income, in border prices. They later on assume, however, that public income is rationally allocated and use it interchangeably with public investment (or, even if public income is not optimally allocated, at least, public investment is one of its most important use).

Each numeraire chosen has its own advantages and disadvantages, depending on convenience or whatever purposes the project evaluator might have. This study uses consumption as numeraire.

2. The Social Rate of Discount and the Shadow Price of Investment

In general, the social rate of discount is defined by the rate of fall in the value of the numeraire. With consumption as numeraire, this rate of fall in its value is the "consumption rate of interest" (CRI).

Why would the value of consumption fall in the first place? With capital accumulation and income growth, the level of consumption would grow over time. And with diminishing marginal utility as consumption rises, the value (marginal utility) of consumption would fall. Future consumption should necessarily be discounted, and at that rate of fall. An additional factor is the rate of pure time preference -- present consumption is intrinsically preferred over future consumption.

In the traditional approach, the market rate of interest (MRI) is used to represent CRI. Presumably, MRI represents the private consumption rate of interest (PRI). In effect, CRI = PRI in the traditional approach.

This assumption of equality between CRI, MRI, and PRI is the source of one of the main issues raised against the traditional approach. Non-traditionalists argue that it is highly improbable for CRI to equal MRI. And that, it is highly probable for CRI to be lower than MRI. One reason for this is due to the so-called "isolation paradox" put forward by Marglin and Sen. In essence, the isolation paradox arises from the tendency for each member of the present generation, in isolation, to save less than what he would have wanted to save if he knew that others would do the same. This implies that CRI would be less than PRI.

If CRI is less than PRI, then the shadow price of investment (SPI) must necessarily be greater than one, i.e, a premium must be placed on investment. In particular, if q is the marginal return to investment (PRI would equal q, net of taxes, if the capital market works perfectly), and i is CRI, and there is no reinvestment, then,

$$SPI = q/i.$$

With reinvestment, whereby a proportion s is saved and reinvested, then,

$$SPI = (1-s)q/(i-sq).$$

In either case, SPI > 1.

Following Squire and van der Tak (1975) and Ray (1984), CRI could be estimated using:

$$CRI = ng + p$$

where n is the elasticity of the marginal utility of consumption, g is the average growth of per capita consumption, and p is the pure rate of time preference.

If investment is the numeraire, the social rate of discount is the rate of fall in the value of investment. (This is also, in effect, the numeraire in Squire and van der Tak, with the assumption of rational allocation of public income into its various uses and, in addition, that public investment and private investment are equally valuable.) This is measured by the accounting rate of interest (ARI), which is typically derived as follows:

$$ARI = sq + (1-s)q/SPI.$$

The first term, sq, is the returns saved and reinvested. The second term, (1-s)q/SPI, is the part consumed deflated by the value of the numeraire.

Using the Squire and van der Tak notation, SPI = vß, where v is their value of public income (in border prices) relative to the average consumption (in domestic prices), and ß is the conversion factor (to convert to border prices; ß is dependent on the tariff and tax structure).

If s, q, i and ß are assumed to be constant, then SPI and v are also constant. This means that ARI = CRI. This suggests that ARI estimated using the values of s, q and SPI could at least be used as a check on CRI, an upper limit.

ARI is more likely to be greater than CRI, consistent with a falling value of v. The value of i would tend towards q over time, and with constant s, this means that SPI would tend to equal unity over time. This implies further that ARI would approach CRI. Little and Mirrlees suggest that if a time T could be planned where the investment premium would disappear (SPI approaching unity), then an initial estimate of SPI could be estimated by:

$$SPI_0 = [1 + 1/2(ARI\text{-}CRI)]^T$$

3. The Income Distribution Weight (d)

Assigning different weights to costs and benefits accruing to different income groups is a radical change over the traditional cost-benefit analysis. The final result of the evaluation could be drastically different. Whether the project evaluator would include d or not in the analysis would rest on the purposes of the policymaker and/or project evaluator himself. The inclusion of d is a controversial issue, especially since d is not observable. On the other hand, no matter how arbitrarily specified a particular d is, the policymaker is forced to be explicit and consistent in the value judgments he makes.

Various methodologies for estimating d have been suggested in the different guidelines (including those cited here). One is discussed in part V of this study (the section on labor) and will not be elaborated further in this section.

C. *Summary*

This chapter is an attempt to provide an overview of the concepts and issues in cost-benefit analysis. One objective is to clarify the differences between the different approaches. Hopefully, a better understanding of these differences would help the project evaluator decide which is the most appropriate approach to take.

III. THE SHADOW PRICE OF FOREIGN EXCHANGE[3]

The shadow price of foreign exchange or the shadow exchange rate (SER) is an indication of the premium placed by the economy on foreign exchange. The wedge between the SER and the official exchange rate (OER) is attributed not only to a balance of payments (BOP) disequilibrium but perhaps, even more importantly to the existing protection system. Indeed, the SER is usually calculated as a summary measure of the bias of the protection structure. As such,

3. The discussion in this paper is a summary of PIDS Staff Paper Series No. 84-03, "Estimating the Shadow Exchange Rate, the Shadow Wage Rate and the Social Rate of Discount for the Philippines" by Medalla and Power, specifically the part on the shadow exchange rate.

the wedge does not indicate a need for a corresponding devaluation to the extent of the wedge; rather, the wedge caused by the protection structure implies a need for reforms.

The SER is primarily used as a general conversion factor for non- tradables to correct for price distortions in project evaluation. The need for shadow pricing in project evaluation arises from price distortions brought about by market imperfections due to genuine market failures and to government intervention or policies (in this case, the protection system). The SER is also used as a cut-off point in the domestic resource cost (DRC) criterion, a social cost-benefit analysis used in ranking and selecting projects. It is also used in deriving the net effective protection rate (EPR) to determine the absolute penalty or protection received by the industry. Finally, the SER gives an indication of the general penalty on exports due to a lower OER than what would have prevailed were there no distortions as a result of which exporters get less value for their foreign exchange earnings.

In project evaluation, however, it is still ideal to decompose as much as possible, nontraded goods into traded components and primary factors. This is especially recommended for nontraded commodities with substantial traded inputs (Part VI deals with this problem of estimation). For many other nontraded inputs, however, the use of the SER would be most convenient.

A. *Methodology*

Two methodologies were used in the estimation of the shadow price of foreign exchange: the UNIDO method and the Bacha-Taylor method.

The UNIDO method evaluates the SER as the marginal social value of foreign exchange. This measures the SER as the value of incremental consumption due to a marginal increase in foreign exchange. It assumes that the protection system will not change in the duration of the project evaluated. The formula is then derived as

$$P^F = \frac{\sum_i dMi\ (1+Ti) + \sum_j dXj\ (1+Sj)}{\sum_i dMi + \sum_j dXj}$$

where

P^F is SER as a proportion of the official exchange rate
dMi and dXj are marginal changes in import i and export j respectively
Ti is the implicit tariff on import i, and
Sj is the implicit subsidy on export j.

In terms of elasticities,

$$p^F = \frac{\sum_i n_{mi} Mi\ (1+Ti) + \sum_j e_{fj} Xj\ (1+Si)}{\sum_i n_{mi} MI + \sum_j e_{fj} Xj}$$

where

n_{mi} = import demand elasticity for i
e_{fj} = elasticity of supply for foreign exchange arising from export j
M_i and X_j are imports and exports respectively

The SER derived by the UNIDO method is appropriate when used in evaluating small projects in isolation and in the short-run. In the long-run, it is inadequate since project evaluation is aimed at identifying projects that have long-run comparative advantage such that continued protection is not necessary, implying that the protection system needs adjustment. The UNIDO estimate is thus considered a "second-best" estimate.

The second method is the Bacha-Taylor method which derives the "free-trade equilibrium" exchange rate as the SER. It assumes that the economy will move to free-trade in the lifetime of the project and it implicitly assumes that free-trade is the optimal trade regime.

The formula for SER is derived as:

$$\frac{r^*}{r} = (1 + Sj)^{aj} \quad (1 + Ti)^{ai}$$

where $aj = \dfrac{e_{fj} Xj}{e_{fj} Xj + n_{mi} Mi}$ and $ai = \dfrac{n_{mi} Mi}{e_{fj} Xj + n_{mi} Mi}$

r* is the free-trade equilibrium exchange rate;
r is the actual/official exchange rate;
T and S are the implicit tariff and subsidy, respectively;
X and M are exports and imports, respectively;
e_f and n_m are the elasticities of supply and demand for foreign exchange, respectively; i and j are the nth importable and exportable commodities, respectively.
i and j are the nth importable and exportable commodities, respectively

Under both methods, two sets of estimates were made. The first set used the 1983 input-output (I-O) transactions table. The second set of estimates included only the sectors with high import, export, and production values, i.e., at least one percent of total imports and exports, respectively, and those in the top 20 industries with high production values on a three digit PSCC level. Estimates of SER using different ways and weights in deriving the implicit tariffs (T) were done in each set.

The implicit tariff can be derived by using direct price comparison of actual border and domestic prices, as well as, by deriving border prices using the legal tariff and tax rates representing the proportional difference between domestic and border prices.

In weighing the implicit tariffs, the ideal weights are the relative shares of marginal imports and exports. However, because of the data constraint on elasticities, two kinds of weights were devised to approximate the relative shares. The first assumed all demand and supply elasticities to be equal such that the equations:

$$dM = (dr/r)[(Q + M)\, e_{dm} + Q\, e_{sm}]$$

$$dX = (dr/r)[(Q - X)\, e_{dx} + Q\, e_{sx}]$$

where

Q is the output value, e_d and e_s are the demand and supply elasticities, respectively, for importables, m, and exportables, x,

were reduced to weights of (2Q + M) and (2Q - X) for importables and exportables, respectively. The second used the product of free-trade value-added (FTVA) and output (Q) in border prices as weights. (For more details on derivation of implicit tariffs, please refer to "Effective Protection Rates: Estimation Methodology" by Louie Parial, forthcoming in TC-PIDS Joint Research Project Paper Series).

B. *Estimation*

In estimating the SER, the data needed were exports and imports taken from the Foreign Trade Statitics, 1983 I-O table from the National Statistics Office (NSO), prices and production data from several sources but substantially from the NSO and the Annual Survey of Establishments, and tariff and tax rates from the Tariff and Customs Code and the National Internal Revenue Code, respectively.

As can be gathered from the methodology, the bulk of the work in estimating the SER was the derivation of weighted average implicit tariffs[4]. The first step in estimating the weighted

4. The estimation of weighted average implicit tariffs for 1988 was done by L. Parial in the Tariff Commission-PIDS Joint Research Project entitled,"Effective Protection Rate: Estimation Methodology."

average implicit tariffs was to get the T of a commodity using (1) actual border price and (2) legal tariff and tax rates to approximate border price. In estimating SER where direct price comparisons were used to derive the implicit tariffs, derived border prices by legal tariff and tax rates were substituted for those commodities where price data were not available or were not comparable due to non-homogeneity.

The next step was to get an average T for each sector. For the mixed sector, the importable and exportable part of the output was determined using different "rules" (Table 1). The average T was then computed using the weights mentioned in the methodology, i.e., (2Q+M) and (2Q-X), and the product of FTVA and Q. The sectors were then grouped into three: importables, major exportables and minor exportables.

For the elasticity estimates, a range of values were used based on elasticity estimates in Balassa (1971) and the assumptions included in the estimation were that world supply elasticity for imports and world demand elasticities for minor exports, e_{x2}, are infinite. The range of values for the elasticity of demand for imports, n_m, was from two to six, for the elasticity of supply for exports, n_x, from three to six and for the elasticity of demand for major exports, e_{x1}, from six to 11. The range of values for the supply elasticity of foreign exchange from both major and minor exports were then derived using the equation:

$$e_{fj} = \frac{n_{xj} \, (e_{xj} - 1)}{n_{xj} + e_{xj}}$$

The SER was then estimated using both the UNIDO and the Bacha- Taylor methods and are shown in Tables 3 to 10. The SER estimated is the wedge created by the protection structure. The wedge created by the BOP disequilibrium was estimated by [exp(d/u - d*/u*)] where d is the current trade deficit, d* the desired level conservatively set at zero, and $u = e_f X + n_m M$. (Table 2).

C. *Results*

The results using the various sets of assumption are presented in Tables 3 and 4.

Under the first set of assumptions, i.e., using the UNIDO method, SER estimates varied from 1.164 to 1.199 using book tariff rates and from 1.243 to 1.293 using price comparisons. The estimates varied with the different elasticity assumptions. Consistently low to consistently high elasticities should be used. The middle values are 1.182 using book rates and 1.268 using price comparisons.

Under the second set of estimates, i.e. using the Bacha-Taylor method, the range is somewhat lower varying from 1.153 to 1.181 using book rates and 1.221 to 1.262 using price comparisons. Again, consistently low or consistently high elasticities shall be used.

Table 1

Values of Output, Exports and Imports in 1983 Input-Output Table and Derived Exportable and Importable Output

SECTOR	DESCRIPTION	a/ TYPE	OUTPUT (O)	EXPORTS (X)	IMPORTS (M)	EXPORTABLE OUTPUT (Qx)	IMPORTABLE OUTPUT (Qm)
3	Corn	PM	5079100	600	881500		
4	Coconut, copra made in farms	PX	6557700	41800	0		
6	Banana	PX	3348500	590500	0		
7	Other fruits and nuts	PX	6159600	211700	22500		
8	Vegetables	PM	7083400	13300	127200		
10	Tobacco	MW	292600	307100	606600	307100 b/	0
11	Fiber crops	MW	1328300	244000	352400	1240200 c/	88100
12	Coffee and cacao	PX	2532400	426700	152900		
13	Other commercial crops, n.e.c.	PM	1666700	54500	1664500		
19	Commercial fishing, offshore and coastal	MW	8486500	43900	5800	6789200 d/	1697300
20	Inland fishing and other fishery activities	MW	13059200	178100	8300	10447360 d/	2611840
21	Logging	PX	8652700	678700	400		
22	Other forestry activities	PM	561900	7200	120700		
23	Gold and other precious metals	PX	4278400	3466300	2100		
24	Copper ore	PX	2647000	2351400	0		
25	Other metallic mining	PX	589100	325300	30100		
26	Sand, stone and clay quarrying	PM	1672100	19400	121500		
27	Other non-metallic mining and quarrying	PM	833100	34300	20129900		
28	Rice and corn milling	PM	26278800	0	0		
29	Sugar milling and refining	PX	6347400	2894200	6100		
30	Milk processing	PM	3011200	26600	1226100		
31	Other dairy products	PM	1410700	2500	317100		
32	Crude coconut, vegetable and animal oils & fats	PX	12579600	5401100	248400		
33	Refined (cooking) oil and margarine	PM	7271000	16300	187700		
34	Slaughtering and meat packing plkants	PM	17627000	4600	162500		
35	Meat processing	PM	2004800	900	1100		
36	Flour and other grain mill	PM	6934400	8200	385000		
37	Animal feeds	MW	6869200	741200	1025600	2223600	4645600
38	Fruit and vegetable preserves	MW	3240600	903600	128500	2710800	529800
39	Fish preparations	MW	6313600	1237300	84900	4735200 e/	1578400
40	Bakery products including noodles	MW	6818000	117400	65000	352200	6465800
41	Cocoa products and confectionery	MW	3110000	252700	70600	788100	2321900
42	Coffee, ground or instant	MW	2460900	18400	1200	55200	2405700
43	Dessiccated coconut	PX	1723600	887300	2500		
45	Miscellaneous food manufactures, n.e.c.	MW	3469700	142700	135400	428100	3041600
46	Wine and liquor	PM	1608700	50900	167100		
47	Brewery and malt products	MW	2057600	21800	1600	1851840 f/	205760
49	Cigars and cigarettes	PM	6120000	10800	56300		
50	Tobacco leaf processing	PX	1869500	1100	0		
51	Textile mill products	PM	9495900	161200	2061600		
52	Knitting mill products	MW	3116400	1645800	1616100	1645800 g/	1470600
53	Other made-up textile goods	MW	1893900	414300	420900	1242900	651000
54	Wearing apparel	PX	10671200	3294600	153900		
55	Footwear except rubber, plastic or wooden	PX	1809400	1321600	102800		
56	Lumber,rough or worked	PX	6314600	1356300	7800		
57	Veneer and plywood	PX	4237700	1447100	0		
58	Other wood, cork and cane products	PX	1416600	285200	16000		
59	Pulp, paper and paperboard	PM	1451700	99000	1134900		
60	Converted paper and paperboar products	PM	2121100	22900	169500		
61	Publishing and printing	PM	2250200	33200	242300		
62	Leather and leather products	MW	549500	301600	509500	301600 g/	247900
63	Rubber tires and tubes	PM	2320700	5400	163300		
64	Rubber footwear	PM	574500	13100	21900		
65	Other rubber products	PM	424000	15800	289600		
66	Fabricated plastic products	MW	5135100	154800	115000	464400	4670700
67	Drugs and medicines	PM	4551500	65600	836000		
68	Basic industrial chemicals	PM	2765500	383900	3742200		
69	Fertilizer	PM	1690600	200	1155500		
70	Plastic materials	PM	1227800	94400	2669900		
71	Pesticides, insectides, etc	PM	848900	14200	146700		
72	Paints, varnish and related compounds	PM	1936200	4700	235600		
73	Soap and synthetic detergents	PM	2697200	6500	89600		
74	Cosmetics and toilet preparations	PM	590700	46900	221200		
75	Other chemical products	PM	1244300	107200	1192600		
76	Products of petroleum, coke and coal	PM	38884400	1607400	4213800		
77	Cement	MW	3512700	55700	16500	167100	3345600
78	Glass and glass products	PM	2144400	37000	175300		
79	Other non-metallic mineral products	MW	1690100	118900	237600	356700	1333400
80	Primary iron and steel products	PM	10324200	294900	4365500		
81	Non-ferrous basic metal products	MW	315200	157600	174300	157600	157600
82	Fabricated metal products	PM	7214100	94500	2134300		
83	Machinery and equipment except electrical	PM	9291700	291800	9647900		
84	Electric industrial machinery and equipment	PM	638100	0	5255100 h/		
85	Electrical appliances and housewares	PM	2639900	163900	482600		
86	Batteries	PM	1998900	23000	43300		
87	Wires and wiring devices	PM	975400	100500	598700		
88	Semi-conductor devices	PX	3665600	2588200	1568200		
89	Misc. electrical eqpt., supplies & accessories	PM	2011000	42000	1965300		
90	Motor vehicles	PM	2061500	2200	858300		
91	Other trans., eqpt., & acc. incl. maj. repair	PM	1723100	252900	3263300		
92	Furnitures and fixtures, prim. of wood	PX	1170300	700200	10900		
93	Furnitures and fixtures, prim. of metal	PM	170200	1600	4000		
94	Musical instruments	PM	309300	2200	39800		
95	Artists' and office supplies	PM	430400	1100	62200		
96	Miscellaneous manufactures, n.e.c. and scrap	PM	3034200	1512600	2396500		

a/ Notation: PM - Purely Importable Sector
PX - Purely Exportable Sector
MW - Mixed Sector

b/ Qx = X and Qm = 0

c/ Qm = 25% of M and Qx = O - Qm

d/ Qx = 80% of Q; Qm = 20% of O

e/ Qx = 75% of Q; Qm = 25% of O

f/ Qx = 90% of Q; Qm = 10% of O

g/ Qx = X and Qm = Q - Qx

h/ The original I-O data for this sector were:

Oo = 638,100
Xo = 5,479,900
Mo = 10,735,000

To eliminate the discrepancy between output and export levels, it was assumed that exports of the sector were mainly re-exports. Thus:

X = O
M = Mo - Xo = 5,255,100

Source: Tariff Commission

Table 2

SER from BOP Disequilibrium

e fx1	e fx2	n m	SER from BOP
1.67	3	2	1.0555
		4	1.0350
		6	1.0256
	6	2	1.0502
		4	1.0328
		6	1.0244
2.14	3	2	1.0507
		4	1.0331
		6	1.0245
	6	2	1.0463
		4	1.0311
		6	1.0234
2.5	3	2	1.0476
		4	1.0317
		6	1.0238
	6	2	1.0436
		4	1.0299
		6	1.0227
3.53	3	2	1.0404
		4	1.0283
		6	1.0218
	6	2	1.0375
		4	1.0269
		6	1.0209
		d =	1657199069
		M =	8731388636
		X1 =	6027288600
		X2 =	1046900967

Table 3

(1) 1988 SER using I-O

e fx1	e fx2	n m	UNIDO	Bacha-Taylor	Unido and BOP	BT and BOP
1.67	3	2	1.243	1.221	1.312	1.289
		4	1.314	1.296	1.360	1.341
		6	1.347	1.333	1.382	1.367
	6	2	1.220	1.199	1.281	1.259
		4	1.295	1.276	1.337	1.318
		6	1.331	1.315	1.364	1.347
2.14	3	2	1.220	1.198	1.282	1.259
		4	1.295	1.276	1.338	1.318
		6	1.332	1.316	1.365	1.348
	6	2	1.201	1.180	1.257	1.234
		4	1.278	1.258	1.318	1.297
		6	1.317	1.300	1.348	1.330
2.5	3	2	1.205	1.184	1.263	1.240
		4	1.282	1.262	1.323	1.302
		6	1.321	1.304	1.352	1.335
	6	2	1.189	1.168	1.241	1.218
		4	1.266	1.246	1.304	1.283
		6	1.307	1.289	1.337	1.318
3.53	3	2	1.172	1.150	1.219	1.197
		4	1.250	1.229	1.286	1.264
		6	1.293	1.274	1.321	1.301
	6	2	1.172	1.139	1.215	1.182
		4	1.250	1.216	1.284	1.249
		6	1.293	1.262	1.320	1.288

(1)
using actual border prices
using (FTVA * Q) as weights

Table 4

(2) 1988 SER using I-O

e_{fx1}	e_{fx2}	n_m	UNIDO	Bacha-Taylor	Unido and BOP	BT and BOP
1.67	3	2	1.164	1.153	1.229	1.217
		4	1.214	1.205	1.256	1.247
		6	1.237	1.230	1.269	1.261
	6	2	1.149	1.138	1.207	1.195
		4	1.201	1.191	1.240	1.230
		6	1.226	1.218	1.256	1.248
2.14	3	2	1.148	1.137	1.207	1.195
		4	1.201	1.191	1.240	1.230
		6	1.226	1.218	1.256	1.248
	6	2	1.136	1.125	1.188	1.177
		4	1.189	1.179	1.226	1.215
		6	1.216	1.208	1.245	1.236
2.5	3	2	1.138	1.127	1.192	1.180
		4	1.192	1.181	1.229	1.219
		6	1.219	1.210	1.248	1.239
	6	2	1.127	1.116	1.176	1.165
		4	1.181	1.170	1.216	1.205
		6	1.209	1.200	1.237	1.227
3.53	3	2	1.114	1.103	1.159	1.148
		4	1.169	1.158	1.202	1.191
		6	1.199	1.189	1.225	1.215
	6	2	1.114	1.096	1.156	1.137
		4	1.169	1.150	1.201	1.181
		6	1.199	1.181	1.224	1.206

(2)
using tariff and tax rates
using (FTVA * Q) as weights

Table 5

(3) 1988 SER using I-O

e fx1	e fx2	n m	UNIDO	Bacha-Taylor	Unido and BOP	BT and BOP
1.67	3	2	1.236	1.216	1.305	1.284
		4	1.305	1.289	1.351	1.334
		6	1.337	1.324	1.372	1.358
	6	2	1.214	1.194	1.275	1.254
		4	1.287	1.269	1.329	1.310
		6	1.322	1.307	1.354	1.339
2.14	3	2	1.215	1.194	1.276	1.255
		4	1.287	1.269	1.330	1.311
		6	1.323	1.307	1.355	1.340
	6	2	1.196	1.176	1.252	1.231
		4	1.270	1.252	1.310	1.291
		6	1.309	1.292	1.339	1.322
2.5	3	2	1.200	1.180	1.257	1.236
		4	1.275	1.256	1.315	1.296
		6	1.312	1.296	1.343	1.327
	6	2	1.184	1.164	1.236	1.215
		4	1.259	1.240	1.297	1.277
		6	1.299	1.282	1.328	1.311
3.53	3	2	1.168	1.148	1.215	1.194
		4	1.244	1.224	1.279	1.258
		6	1.285	1.267	1.313	1.295
	6	2	1.168	1.137	1.212	1.180
		4	1.244	1.211	1.277	1.244
		6	1.285	1.255	1.312	1.282

(3)
using actual border prices
using (2Q+M) and (2Q-X) as weights

Table 6

(4) 1988 SER using I-O

e_{fx1}	e_{fx2}	n_m	UNIDO	Bacha-Taylor	Unido and BOP	BT and BOP
1.67	3	2	1.154	1.144	1.218	1.207
		4	1.200	1.192	1.242	1.234
		6	1.221	1.215	1.253	1.246
	6	2	1.139	1.130	1.197	1.186
		4	1.188	1.179	1.227	1.218
		6	1.211	1.204	1.241	1.234
2.14	3	2	1.139	1.129	1.197	1.186
		4	1.188	1.179	1.227	1.218
		6	1.211	1.204	1.241	1.234
	6	2	1.127	1.117	1.179	1.169
		4	1.177	1.168	1.213	1.204
		6	1.202	1.194	1.230	1.222
2.5	3	2	1.129	1.119	1.183	1.173
		4	1.179	1.170	1.216	1.207
		6	1.204	1.197	1.233	1.225
	6	2	1.119	1.109	1.168	1.158
		4	1.169	1.160	1.204	1.195
		6	1.196	1.188	1.223	1.215
3.53	3	2	1.107	1.098	1.152	1.142
		4	1.158	1.149	1.191	1.181
		6	1.186	1.178	1.212	1.203
	6	2	1.107	1.091	1.149	1.131
		4	1.158	1.141	1.189	1.171
		6	1.186	1.170	1.211	1.194

(4)
using tariffs and taxes to derive border prices
using (2Q+M) and (2Q-X) as weights

Table 7

SER of TOP X, M and Q

e_{fx1}	e_{fx2}	n_m	UNIDO	Bacha-Taylor
1.67	3	2	1.228765	1.206894
		4	1.302602	1.283797
		6	1.338068	1.322460
	6	2	1.213159	1.191510
		4	1.288876	1.269332
		6	1.326583	1.309963
2.14	3	2	1.204133	1.182204
		4	1.281186	1.260948
		6	1.320183	1.302779
	6	2	1.191487	1.170008
		4	1.269236	1.248584
		6	1.309827	1.291681
2.5	3	2	1.188302	1.166602
		4	1.266598	1.245617
		6	1.307639	1.289150
	6	2	1.177403	1.156244
		4	1.255790	1.234576
		6	1.298042	1.278976
3.53	3	2	1.153181	1.132723
		4	1.231663	1.209656
		6	1.276339	1.255762
	6	2	1.153181	1.125867
		4	1.231663	1.201436
		6	1.276339	1.247687

using direct price comparisons
using FTVA * Q as weights

Table 8

SER of TOP X, M and Q

e_{fx1}	e_{fx2}	n_m	UNIDO	Bacha-Taylor
1.67	3	2	1.1542556164	1.143021
		4	1.20576927	1.196165
		6	1.2305131992	1.222563
	6	2	1.1437323308	1.132645
		4	1.1964360048	1.186486
		6	1.2226819993	1.214245
2.14	3	2	1.1369708394	1.125674
		4	1.1907614732	1.180397
		6	1.2179848954	1.209098
	6	2	1.1284853202	1.117448
		4	1.1826543412	1.172106
		6	1.2109345768	1.201695
2.5	3	2	1.125861813	1.114664
		4	1.180538404	1.169775
		6	1.2091981337	1.199742
	6	2	1.1185772131	1.107682
		4	1.1732191288	1.162362
		6	1.202671812	1.192946
3.53	3	2	1.1012171572	1.090621
		4	1.1560557483	1.144724
		6	1.1872728318	1.176713
	6	2	1.1012171572	1.086022
		4	1.1560557483	1.139195
		6	1.1872728318	1.171302

using tariffs and taxes
using FTVA * Q as weights

Table 9

SER of TOP X, M and Q

e_{fx1}	e_{fx2}	n_m	UNIDO	Bacha-Taylor
1.67	3	2	1.2229994223	1.202496
		4	1.294366757	1.276749
		6	1.3286471497	1.314029
	6	2	1.2077864488	1.187464
		4	1.2810148945	1.262679
		6	1.3174820557	1.301893
2.14	3	2	1.1992257081	1.178671
		4	1.2736909436	1.254733
		6	1.311377775	1.295080
	6	2	1.18688342	1.166729
		4	1.2620594093	1.242691
		6	1.3013068363	1.284294
2.5	3	2	1.1839462041	1.163608
		4	1.259606913	1.239955
		6	1.2992658497	1.281953
	6	2	1.1732998097	1.153448
		4	1.2490820917	1.229190
		6	1.2899296995	1.272058
3.53	3	2	1.1500496139	1.130876
		4	1.225877857	1.205265
		6	1.2690433823	1.249777
	6	2	1.1500496139	1.124121
		4	1.225877857	1.197231
		6	1.2690433823	1.241909

using actual border prices
using (2Q+M) and (2Q-X) as weights

Table 10

SER of TOP X, M and Q

e_{fx1}	e_{fx2}	n_m	UNIDO	Bacha-Taylor
1.67	3	2	1.1444015384	1.134600
		4	1.1923535326	1.183982
		6	1.2153866639	1.208460
	6	2	1.1345504959	1.124868
		4	1.1836287773	1.174947
		6	1.2080693562	1.200711
2.14	3	2	1.1283269098	1.118470
		4	1.1783935092	1.169358
		6	1.2037321989	1.195989
	6	2	1.1203768931	1.110739
		4	1.1708120007	1.161609
		6	1.1971428574	1.189086
2.5	3	2	1.1179956527	1.108224
		4	1.1688841664	1.159501
		6	1.1955583065	1.187319
	6	2	1.1111663286	1.101652
		4	1.16203737	1.152565
		6	1.1894575044	1.180976
3.53	3	2	1.095076428	1.085828
		4	1.1461107741	1.136230
		6	1.1751622762	1.165959
	6	2	1.095076428	1.081481
		4	1.1461107741	1.131043
		6	1.1751622762	1.160899

using tariffs and taxes
using (2Q+M) and (2Q-X) as weights

Table 11

Second Approach: International Borrowing rate

	Year	US Prime Rate (%)[1]	LIBOR (%)[1]	% change in REER[2]	q[3]
	1978	9.07	8.85	7.44	
	1979	12.60	12.07	-11.02	
	1980	15.24	14.11	-6	
	1981	18.88	16.89	-2.49	
	1982	14.81	13.20	-3.23	
	1983	10.79	9.66	23.12	
	1984	12.04	10.84	-2.28	
	1985	9.93	8.39	-11.63	
	1986	8.35	6.84	26.77	
	1987	8.21	7.16	6.05	
	1988	9.32	7.95	3.91	
Average:	79-88	12.02	10.71	2.32	12.3

Notes: q = IBR x (1 + % change in REER)

where IBR is the international borrowing rate
(in the computation, the higher value - the US Prime Rate - was used).

REER is the real effective exchange rate.

Sources: (1) International Financial Statistics and Department of Economic Research, Central Bank
(2) Medalla (1984)
(3) Medalla and Power (1985)

Adding the impact of the BOP disequilibrium the wedge increases by a factor ranging from 1.021 to 1.056.

The choice of which SER to use lies with the project evaluator. The main consideration is that it should be consistent with the time frame, conditions and assumptions used in the evaluation. The estimates derived using the Bacha-Taylor method is recommended for long-run project evaluation because of the limitations set by the assumptions in the estimates using the UNIDO method. The estimates with the higher trade elasticities should be used when the longer run period is considered.

Finally, the estimates using price comparison would be preferred.

IV. THE MARGINAL PRODUCTIVITY OF CAPITAL

A. *Concept*

The marginal productivity of capital, q, is a basic parameter used in both the traditional and the new approach. For example, in the traditional approach, q is taken to be the social rate of discount. In the new approach, with investment as the numeraire, the accounting rate of interest, ARI, is typically estimated as

$$ARI = sq + (1-s)q/\beta v$$

where

s = saving rate[5]
β = consumption conversion factor[6]
v = shadow price of investment

Hence, q is again a major parameter.

Using consumption as the numeraire, the appropriate social discount rate is the consumption rate of interest (CRI). This could be independently derived and estimated using a particular welfare function as

$$CRI = ng + p$$

where

n = elasticity of marginal utility of consumption p = rate of pure time preference
g = growth rate of per capita income

5. s would be inclusive of private saving and public investment and other expenditure, i.e. the part of national income that goes to private and public investment and other expenditures.

6. This could be estimated by the SER.

Estimation of CRI using this formula thus entails value judgments, particularly about how egalitarian the government is assumed to be (the value of n).

In contrast, q represents a more empirically based estimate. And although ARI and CRI should be independently estimated, one could reasonably approximate CRI to be equal to ARI. This, in fact, is implied when v is taken to be constant. Indeed, v is often derived as

$$v = (1-s)q/(i-s_q)ß$$

again with q as an important parameter. Of course it is more realistic to assume a falling v. This means ARI CRI. The gap could be substantial. However, the gap should diminish over time.

The interrelationships between the **concepts of q, ARI, CRI and v are discussed in Part II.**

The method on how to estimate for the marginal productivity of capital discussed below suggests the use of (1) an economy wide data base, (2) an international borrowing rate, and (3) the marginal returns in a specific sector considered important and representative -- in this case, manufacturing.[7]

B. *Estimation Methodology*

This study uses three approaches to estimate the marginal product of capital (q). The first uses a Cobb-Douglas production function from which the marginal product of capital is derived.

Given:

$$Y = A\ L^{1-\alpha}\ K^{\alpha} \qquad (1)$$

$$MPk = \alpha Y/K \qquad (2)$$

where Y = output
K = capital
L = labor
α = share of capital in output
$1-\alpha$ = share of labor in output

7. Other sectors could be used, e.g. public investment, the commercial sector, etc.

To estimate equation (2), Y/K is estimated using the inverse of the incremental capital-output ratio (ICOR) and is estimated via an indirect approach. The share of labor ($1-\alpha$) is estimated first by using data from the national income accounts (NIA), where the compensation of employees and entrepreneurial and property income are adjusted for dividends and rent. There are two estimates of: an upper limit which is derived from a low estimate of ($1-\alpha$) and a lower limit which is derived from a high estimate of ($1-\alpha$). The second approach is to use an international borrowing rate.

Figure 1 shows the supply and demand for investment. The demand for investment is represented by the marginal efficiency of investment (MEI) curve and S is the supply of investible funds. Assuming a perfectly mobile international capital market, the amount of investment at ib is equal to the MEI. The total amount invested is OI_2; domestic level of investment at ib is equal to OI_1; and I_1I_2 is the amount of foreign borrowing.

However, ib may be less than q if foreign borrowing is rationed: the presence of an external debt problem or domestic restraint on accumulation of foreign debt will make the supply of foreign capital less elastic at ib. This situation is illustrated in Figure 2. If a country can borrow only I_1I_3, then the supply for investible funds becomes S'. The discussion suggests that the international borrowing rate could be an estimate of q but it is a lower bound.

One more adjustment on ib is still necessary. To express ib in domestic real terms, it should be adjusted for changes in the real effective exchange rate (REER).

q = ib(Et+1/Et)	where
or	Et + 1 = real exchange rate in period t + 1
q = ib(1 + % in REER)	Et = real exchange rate in period t

The third approach is the rate of return to manufacturing. (Rm) which is the ratio of net returns to manufacturing (Rn) to replace the cost of capital (RC). Rn is estimated by removing from gross output all explicit and implicit cost of production except the cost of capital, such as indirect taxes, operating costs, cost of good resold, total wages and benefits, imputed return to land. The capital stock at replacement cost (RC) is estimated by summing over an estimate of the life of assets and bringing it to current prices by inflating the original acquisition cost of capital by an appropriate investment goods index. The study does not provide an estimate using this approach because of a nasty data problem: the coverage of large establishments used by the National Statistics Office (NSO) over the last 30 years has not been consistent. At least three coverages were used: (1) all establishments defined as employing more than one worker; (2) establishments employing more than five workers; and (3) establishments employing more than

FIGURE 1

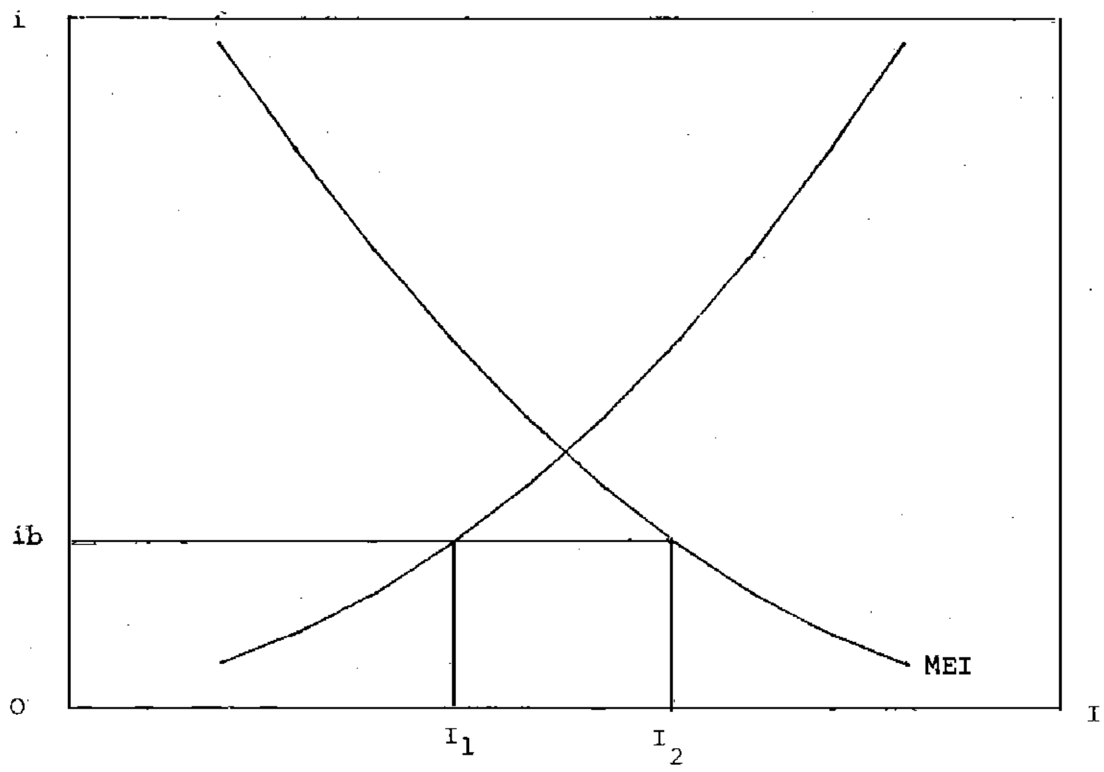
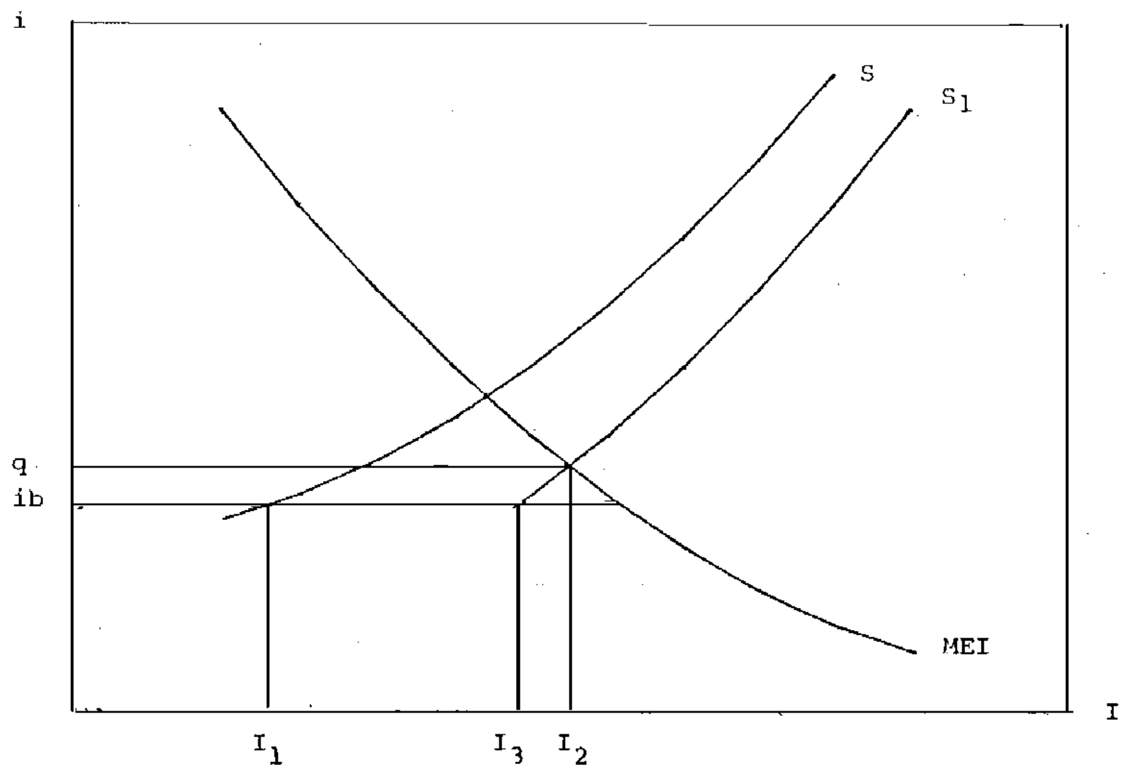


FIGURE 2



10 workers. Hence, one cannot get a consistent set time series data on capital expenditures with which to estimate the replacement cost of capital.

C. *Estimation Procedure*

1. First Approach: ICOR and share of capital (α)

The first part shows how to estimate the share of capital (α) from the National Income Accounts data: Expenditures Account by estimating the share of labor (1- α) first (Table 12).

Step 1: Data from the Expenditures Account lumps entrepreneurial property income (EPI) with compensation of employees (CE). To separate CE from EPI, it is assumed that CE is equal to 1/2 of EPI + CE. CE is considered a lower estimate of the returns to labor (Medalla 1984).

Step 2: The total amount of EPI+CE is adjusted for rent and dividends. Dividends are assumed to be 1/2 of corporate income after tax while rent is assumed to be 1/3 of value-added in agriculture (VAa) and 1/10 of all other income taken as the difference between gross domestic product (GDP) in constant prices and VAa.

Step 3: The sum of dividends and rent, X , sis subtracted from the total EPI+CE : Y = EPI + CE - X. Y is considered a higher estimate of the share of labor.

Step 4: The two estimates of return to labor are expressed as ratios of National Income (NI) to give a lower and a higher bound estimate of (1- α): CE/NI and Y/CE respectively.

Step 5: A ten year (1979-1988) simple average is taken for CE/NI and Y/NI.

Step 6: The averages from step 5 are (1- α) from which two average shares of capital are computed: (1) is the lower bound and (2) is the higher bound. The MPk is the average of (1) and (2).

Step 7: To estimate $\Delta Y/\Delta K$ the inverse of the ICOR is used, i.e.,

$$\frac{\Delta Y}{\Delta K} = \frac{NDPt - NDP^{t-1}}{I^{t-1}}$$

where NDPt = net domestic product (in constant 1972 prices) adjusted for only 2/3 of depreciation

I^{t-1} = is net investment in (in constant 1972 prices) period t-1 adjusted for 2/3 of depreciation

Step 8: However, $\Delta Y/\Delta K$ is in domestic prices. It is brought to border prices by using the SCF/CCF where the SCF is the standard conversion factor for manufacturing and the CCF is the capital conversion factor. The SCF is the reciprocal of one plus the implicit tariffs (Ti) for manufacturing (I/O sectors 28-96) and the CCF is the reciprocal of one plus the implicit tariff on capital equipment (Tk) (I/O sectors 83-91) sectors. The average Ti for and Tk for 1985, 1986 and 1987 are .8217 and .8354 respectively. The conversion factor is .9836.

Step 9: There are two ways to estimate implicit tariffs: one is to use tariffs and taxes; second, is to use price comparisons. If non-tariff measures are prevalent, the preferred method is the second one. For a detailed discussion on implicit tariff estimation, see Parial (forthcoming TC-PIDS Joint Research Project Paper Series).

Preliminary estimate using NIA data from 1979-1988 shows a q = 10.1 percent.

2. Second Approach: International Borrowing Rate

Step 1: The US prime rate and the London Interbank Offered Rate (LIBOR) are chosen as representing international borrowing rates and the data are available in the International Financial Statistics Yearbook and at the Department of Economic Research, Central Bank, respectively. A ten year average for both is taken: 12.02 per cent for the former and 10.71 per cent for the latter. This study uses the higher rate (ib) (Table 11).

Step 2: ib is then adjusted for changes in the real exchange rate. This study uses the real effective exchange rate (REER) derived as follows:

$REER_o = 100$ for the base year where $REER_t$ is the REER in period t

$REER_t = REER_{t-1} \;\; *(1 + RE')$

$REER_{t-1}$ is the REER in period t-1

$RE_t' = \Sigma wi\,(Ri' + CPIi' - CPIo')$

where RE_t' = change in REER in period t

wi = trade weight for training partner i

Ri' = % change in nominal exchange rate with country i

CPIi' = % change in CPI of country i

CPIo' = % change in CPI for Philippines

The average of the change in the real effective exchange rate is 2.32 percent. This gives an estimate of q= 12.3 percent.

Since the first approach includes recession years, 1983-1985, this could have introduced a short-term bias in the 10-year average. Hence, the study recommends the estimate from the second approach.

Table 12

First Approach: ICOR and Share of Capital

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	AVERAGE (1979-1988)
a.EPI + CE (given in the NIA)	134,168	158292	193779	223531	247970	278068	416147	466644	460193	508300	621453	
a.1 CE =1/2 of (a)	67084	79146	96890	111766	123985	139034	208074	233322	230097	254150	310727	
Corporate income after tax	5,075	12059	14524	16003	14896	16209	-1675	-3169	15423	23170	26594	
b.dividends = 1/2 corporate income after tax	2538	6030	7262	8002	7448	8105	-838	-1585	7712	11585	13297	
Gross Value Added in Agri. (VAa) (incl.livestock and poultry)	34,128	40856	43820	49419	54593	60212	104346	123670	113410	123544	139640	
c. National income (NI)	143,412	175115	214230	247042	272106	304877	429686	481175	490712	555515	677917	
d. Gross Domestic Product (GDP)	177,669	217543	264650	305258	340597	384096	540466	612684	627129	708368	826749	
All other income (GDP- VAa)	143541	176687	220830	255839	286004	323884	436120	489014	513719	584824	687109	
e. Rent = 1/3 VA in Agriculture (VAa) (incl.livestock and poultry)	11376	13619	14607	16473	18198	20071	34782	41223	37803	41181	46547	
+1/10 All other income (GDP-VAa)	14354	17669	22083	25584	28600	32388	43612	48901	51372	58482	68711	
x= (b) + (e)	28268	37317	43952	50058	54246	60564	77557	88540	96887	111249	128555	
y = EPI+CE -x	105900	120975	149827	173473	193724	217504	338591	378104	363306	397051	492898	
f. CE/NI (lower bound) - a1	0.468	0.452	0.452	0.452	0.456	0.456	0.484	0.485	0.469	0.458	0.458	0.462
g. y/NI (upper bound) - a2	0.738	0.691	0.699	0.702	0.712	0.713	0.788	0.786	0.740	0.715	0.727	0.727
h. average share of capital (CE/NI) (1-a1)												0.538
i. average share of capital (y/NI) (1-a2)												0.273
j. Average share of capital												0.405

(Table 12 continued)

	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	AVERAGE (1979-1988)
h.1 Gross Domestic Product (GDP)	82,784	87962	92568	96207	98999	99921	93927	89904	91180	95463	101534	
i.1 Depreciation (D)	7,981	8757	9440	10544	11149	11394	11600	10726	9966	9870	9600	
j.1 Net Domestic Product (NDP) = GDP - 2/3 D	77463	82124	86275	89178	91566	92325	86194	82753	84536	88883	95134	
k.1 change in NDP	3983	4661	4151	2903	2389	759	-6131	-3440	1783	4347	6251	
l.1 Gross Domestic Capital Formation	22928	25493	26609	27220	26267	25119	14215	11124	10111	13171	15705	
m.1 net investment (NK t-1) = GDCF- 2/3 D	17607	19655	20316	20191	18834	17523	6482	3973	3467	6591	9305	
n.1 Y / M	0.247	0.265	0.211	0.143	0.118	0.040	-0.350	-0.531	0.449	1.254	0.948	0.255
o.1 Marginal Product of Capital												0.103
o.1' SCF/CCF (.98)												0.101

V. THE SHADOW PRICE OF LABOR

A. *Concept*

Based on economic theory, under pure competition, the price of a resource would be equal to its value in the best alternative use, i.e., its opportunity cost. Accordingly, the price of labor would be equal to its value in alternative employment. This is not the case in many developing countries because of the prevalence of market imperfections and government intervention. In the traditional or agricultural sector, there is excess supply of unskilled labor while in the modern or industrial sector, the wage for this type of labor is set by government legislation and influenced by labor union pressures. Inasmuch as it is not determined by market forces, the market wage does not reflect the true cost of labor to society. If it is used in social project evaluation, the resulting allocation of resources would likewise be distorted. Hence, in place of the market wage, the shadow wage rate (SWR) is estimated to indicate real economic cost and ensure efficiency despite the existence of distortions.

B. *Methodology*

In this paper, estimating the shadow wage rate is done for unskilled labor only because, as previously mentioned, it is in excess supply in developing countries. Two approaches were used in the estimation - the traditional method and the non- traditional method. In the traditional approach, it is assumed that the government is concerned only with efficiency; its only objective is to optimize growth. Thus, the SWR is equal to the direct opportunity cost or efficiency price of labor. In the non- traditional method, the SWR measures not only the efficiency price of labor but also the effect of hiring unskilled labor for project employment on income distribution and saving. The underlying assumption is that the government has two objectives - growth and equity, and it is using project evaluation, in lieu of fiscal measures, to achieve these objectives. Moreover, from society's viewpoint, the employment of unskilled labor not only has a direct opportunity cost but also an indirect cost because it commits the economy to additional consumption which is a reduction to saving and investment (assuming saving is matched by investment). The shadow wage rate is therefore inclusive of the direct opportunity cost and indirect cost of hiring unskilled labor.

1. The direct opportunity cost of labor

When unskilled labor is transferred from the agricultural sector to project employment, output will fall in the former sector because of the reduction in the number of workers. (The assumption that the opportunity cost of unskilled labor is zero is discarded in view of researches which indicate that although un- or under-employment may be widespread in developing countries, most people are involved in some productive activities for at least some part of the year). The decrease in output value is equal to the amount contributed by the migrating workers, i.e., the value of their marginal product. (The marginal product of labor is defined as the additional output produced by an additional unit of labor. It is equal to the marginal physical product of labor multiplied by the output price). Labor studies indicate that the creation of one job in the industrial sector results in the migration of more than one worker from the traditional sector such that the reduction in agricultural output is more than one worker's marginal product. According to migration theories, the number of responding migrants for each job created in the urban sector is exactly equal to the ratio of the total labor force (employed and unemployed) to total employment. This ratio is therefore multiplied by the marginal product of labor in agriculture to obtain output foregone. If the rural labor market is efficient, the agricultural wage can be used as a measure of the marginal product. This is based on the marginal productivity theory which states that in perfect competition, labor will be paid an amount equal to its marginal product. Under this condition, profit is maximized because the cost (wage) is equal to the benefit (marginal product). Studies indicate that the Philippine rural labor market is fairly competitive, hence, in this study, the wage rate is used as a measure of the marginal product.

In the preceding discussion, output foregone is valued in market prices since it is based on the marginal product which is equal to the marginal physical product multiplied by the market price of the output. Instead of the market price, the shadow price of the output should be used. If the output is tradable and subject to infinite elasticities (i.e., imports or exports of this product may be increased without affecting the world price but only the trade balance), the shadow price is its border price (CIF for imports and FOB for exports) because the world market is an alternative source or destination for tradable goods. Thus, foregone output in shadow prices is derived by valuing it in border prices.

2. The indirect cost of labor

In many developing countries, the industrial wage is normally higher than the agricultural wage because of the excess supply of unskilled labor in agriculture and the institutional wage setting in industry. Hence, the transfer of unskilled labor from agriculture to industry would increase the income of the worker equal to the difference between his new wage and his previous wage. Consequently, consumption would also increase. This is counted as a benefit to society according to the welfare weight (income distribution weight) attached to the worker's income level. However, it is also a cost to society because national saving and investment is reduced by this consumption. Therefore, as a benefit, the increased consumption (multiplied by the income distribution weight, d) is subtracted from the social cost of hiring unskilled labor, and as a cost, the saving/investment loss (multiplied by the shadow price of saving, SPS) is added to the direct opportunity cost. Following Medalla and Power (1984), for SWR estimation, it is assumed that saving is not optimal in the Philippines (as indicated by its huge trade deficits). Thus, saving/investment is preferred over consumption. The SPS provides an indication of this premium.

Similar to the case of the foregone output, the increased consumption of the worker should be converted into border prices so that its value would be in shadow prices.

C. Estimation Procedure

Estimates of the SWR for the Philippines were made for 1986, 1987, and 1988 following the assumptions and procedures of Medalla and Power (1984). Data for the country's four major agricultural crops (palay, corn, coconut, and sugarcane) were utilized to represent agricultural output. Given below is a discussion of each component of the SWR, the data used and the estimation procedure.

The formulas used in the estimation of the SWR for unskilled labor (in border prices) are as follows:

$$SWRb = \alpha\, z\, L/N \quad \text{(for the traditional method)}$$

$$SWRb = \alpha\, z\, L/N + B(w - z)(1 - s_w)(SPS - d)$$
(for the non-traditional method)

$\alpha\, z\, (L/N)$ indicates the direct opportunity cost of hiring unskilled labor while $B(w - z)(1 - s_w)(SPS - d)$ represents its indirect cost (net of benefits) resulting from the increased consumption of the worker.

α is the conversion factor to bring the value of foregone output to border prices. It is equal to 1/(1+T) where T is the implicit tariff. An average 1+T for 1986-1988 is estimated by getting the ratio of the domestic price (Pd) of the four major agricultural products to their respective border prices (Pb) weighted by the production value for the same period. Although these products are not directly tradable, they are basically intermediate inputs into highly tradable outputs - rice, corn, various coconut products, and sugar. Hence, following Medalla and Power, the implicit tariffs for the processed products were also used for the inputs. Data on Pd/Pb were taken from the Tariff Commission- PIDS study on the impact effects of import liberalization while the production values were sourced from the Bureau of Agricultural Statistics (BAS).

Crop	(1) 1+T (Ave. 1986-88)	(2) Share of each crop in total production value (Ave. 1986-88)	(1) x (2)
Palay	1.235	.43	.531
Corn	1.80	.18	.324
Coconut	1.0	.21	.21
Sugarcane	1.0	.18	.18
		Weighted average of 1+T =	1.245

$\alpha = 1/(1+T) = 1/1.245 = .803$

z is the marginal product of labor in agriculture which is estimated by getting the average daily wage rate without meals of farm workers by crop and by region, i.e., z = agricultural wage. These data are available from the BAS. The daily wage rate is taken to reflect the marginal product in view of studies which indicate that the Philippine rural labor market is fairly competitive. In the SWR formula, z is for the whole Philippines.

For regions, z is already the direct opportunity cost of hiring unskilled labor. It is assumed that there is no migration regionally from rural to rural. The regions are grouped into four, as follows: Region I - Ilocos and Cagayan Valley; Region II - Central Luzon, Southern Tagalog, and Bicol; Region III - Visayas; and Region IV - Mindanao. For each region, an average z was computed. The data for z are shown below.

Average Wage Rates by Combined Regions (P)

	Phil.	I	II	III	IV
1986	29.69	29.38	34.35	25.29	28.10
1987	32.43	32.88	36.12	28.69	31.81
1988*	36.18	34.85	41.60	31.17	36.66

Average farm wages, by crop and
by combined regions (P)
1986-1988

	Phil.	I	II	III	IV
Palay					
1986	31.80	31.99	35.61	25.35	28.68
1987	32.43	33.18	37.37	27.88	30.73
1988*	36.94	37.02	42.34	30.41	34.34
Corn					
1986	27.04	27.93	28.77	23.40	26.01
1987	28.01	28.80	30.73	26.35	28.07
1988*	30.11	29.17	36.42	29.25	31.86
Coconut					
1986	31.00	30.45	34.68	28.25	30.81
1987	35.36	47.32	36.80	33.18	37.27
1988*	40.20	49.42	43.51	35.42	45.02
Sugarcane					
1986	28.90	27.15	38.35	24.17	26.58
1987	33.93	32.30	39.36	30.28	29.14
1988*	37.46	34.87	44.14	34.10	33.39

*January to June

Source: Bureau of Agricultural Economics

L/N is the ratio of the labor force to employment in urban areas. As discussed previously, it represents the number of responding migrants from the rural areas for each job created in the urban areas. The ratio may also be expressed as 1/(N/L) where N/L is employment rate which is adjusted by considering the underemployed as 50 percent unemployed. Thus, adjusted employment rate = 1 - (unemployment rate + 0.5 underemployment rate). Labor statistics were taken from the Special Releases of the National Statistics Office (NSO) and from the Philippine Statistical Yearbook.

	1986	1987	1988*
Urban areas			
Employment rate (%)	88.5	86.2	87.8
Unemployment rate (%)	11.5	13.8	12.2
Underemployment rate (%)	21.6**	18.4	19.7
Adjusted employment rate (%)	77.7	77.0	77.95
L/N = 1/(N/L)	1.287	1.299	1.283

*as of October 1988
**based on preliminary data, October 1986

Notes:
-The reference periods are the past third quarter for 1986 and the past week for 1987 and 1988.
-Underemployed persons are those working less than 40 hours per week; Underemployment rate = underemployed/employed persons.

ß is the conversion factor to bring the value of the worker's increased consumption to border prices. Since various commodities are involved, a weighing system is needed. In principle, the weight for each commodity should be its importance in the basket of goods purchased by the worker at the margin (Medalla cited in Bautista et al. 1979). In practice, following Medalla's paper, ß = OER/SER where OER is the official exchange rate and SER is the shadow exchange rate which is equal to the OER plus a certain premium. The SER is used as a conversion factor because it is based on a weighted average of implicit tariffs. In this paper, ß = 1/1.2 and 1/1.3, utilizing the middle values for SER based on C. Del Rosario's estimates.

(w - z) is the increase in the worker's income resulting from his transfer from agriculture to industry. w is the daily minimum wage in Metro Manila taken from the Philippine Statistical Yearbook while z, as discussed previously, is equal to the average daily wage in agriculture.

	1986	1987	1988
Daily minimum wage (P)	57.08	58.65	69.33
Agricultural wage (P)	29.69	32.43	36.18*
w - z	27.39	26.22	33.15

*January to June, 1988

s_w is the worker's saving rate. Hence, $(1 - s_w)$ is the consumption ratio, and $(w - z)(1 - s_w)$ is the proportion of increased income that goes to consumption. Following Medalla and Power (1984), s_w is set at zero which means that all of the increased income is consumed.

SPS is the shadow price of saving, also referred to as the shadow price of capital and the shadow price of investment (Manalaysay cited in Bautista et al, 1979). As mentioned previously, it reflects the premium placed on saving and investment over consumption. If saving is not optimal, it is preferred over consumption, and the SPS is greater than unity. The formula for SPS used is as follows:[8]

$$SPS = \frac{q - sq}{i - sq}$$

where:
q = marginal product of capital
s = saving ratio
i = social rate of discount

Note that SPS = 1 if i = q; this is applicable if traditional approach is followed (or if saving is optimal). In estimating the SWR below, it is assumed that saving is not optimal. This implies that SPS is greater than unity and i = q. To estimate an i different from q, Medalla and Power suggest two approaches. In the first method, an independent estimate of the social rate of discount is computed from a projected growth rate of per capita consumption (g) and arbitrary values of the elasticity of the marginal utility of consumption (h), i.e., i = gh. In the second approach, i is derived by setting an arbitrary value for SPS in accordance with the government's valuation of the premium.

Using the first method, the value of h is set at 1 and 1.5. Based on the Updates on the medium term plan for 1988-1992 (July 1988), the average ratio of gross national saving to the gross national product (GNP) is .18 and the average growth rate of per capita real GNP is .041. These figures were substituted for s and g, respectively. For q, .105 (Section 4) is used.

Substituting these figures in the formula, the following estimates were obtained:

	h = 1	h = 1.5
i	.041	.062
SPS	3.90	2.00

8. SPS is equivalent to the notation $v\beta$ used previously (also used in Squire and van der Tak. As noted, v is the value of public income taken to be as equally valuable as public investment and private investment) in border prices. Hence SPS = $v\beta$ where β is the conversion factor. (SPS above uses consumption as numeraire, hence the need for β).

d is the income distribution weight. It is defined as the ratio of the marginal utility of consumption of a particular class (i.e., the newly hired worker) to the marginal utility of consumption at the average level (Medalla and Power 1984). Using the social welfare function suggested by Squire and van der Tak indicated by the marginal utility function MU (c) = c^{-h}.

$$d = \left(\frac{\bar{c}}{c} \right)^h$$

$\bar{c}$ is average annual per capita consumption. Median consumption, which is lower than mean consumption, is considered as average consumption. These data are given in the NSO's Family Income and Expenditure Survey (FIES) but the most recent statistics available are only for 1985. (Results of the 1988 survey are not yet finalized). To estimate average consumption for 1986, 1987, and 1988, the per capita GNP at current prices for each year (obtained from the National Economic and Development Authority) were multiplied by the ratio of median to mean income taken from the 1985 FIES. This assumes that the skewness in the two distributions is about the same and that the shape of the distribution has not changed much over the past three years. Median/mean Income for 1985 = 20480/31052 = 0.6595.

	1986	1987	1988
Per capita GNP	10976	12221	13965
$\bar{c}$	7239	8060	9210

c is the worker's annual consumption. Its value ranges from c_o (which is based on his previous wage, z) to c_n (based on his new wage, w). Since d is defined for per capita consumption levels, only the consumption of the worker is needed; the consumption of his dependents should be excluded. It is assumed that the worker has the same number of dependents as the average employed person (two) but one of them is a child whose consumption is one half of that of the adult. Of the worker's income, 40 percent is consumed by the worker, 40 percent by the dependent adult, and 20 percent by the dependent child. The relevant wage of the worker is further multiplied by 250 days which is the number of working days per year to get annual consumption. Thus, c_o = z x .40 x 25; and c_n = w x .40 x 250.

	1986	1987	1988
c_o	2969	3243	3618
c_n	5708	5865	6933
$c_n - c_o$	2739	2622	3315

h is the elasticity of the marginal utility of consumption. A value of h equal to zero implies that all additional consumption is regarded as equally valuable regardless of the level of consumption of the recipient. If h = 1, the weight on additional consumption decreases proportionately with increases in the existing level of consumption. The higher the h, the higher is the rate of diminishing marginal utility, and the lower will be the weight on additional consumption. In this paper, h is set at 1 and 1.5.

Inasmuch as the value of consumption declines as consumption increases, successive parts of increments must have declining values. Based on the IPPP (Industrial Promotion Policies in the Philippines) technical note on the income distribution parameter, the first peso of increased consumption should be valued at $\left(\frac{\bar{c}}{c_o}\right)^h$ the last peso at $\left(\frac{\bar{c}}{c_n}\right)^h$

and the intervening ones at intervening values. In Medalla and Power's paper, the expression for d was integrated over the whole range of values from c_o to c_n. This yielded the following formula for d:

$$d = \frac{\bar{c}\,(\ln c_n - \ln c_o)}{c_n - c_o} \qquad \text{for } h = 1; \text{ and}$$

$$d = \frac{\bar{c}^h \left(\dfrac{c_o^{1-h} - c_n^{1-h}}{h - 1}\right)}{c_n - c_o} \qquad \text{for } h \neq 1.$$

Substituting the applicable values to the formula, the derivation of d for 1986 is illustrated below:

At h = 1:

$$d = \frac{7239(\ln 5708 - \ln 2969)}{2739}$$

$$= \frac{7239\left(\dfrac{3.7565 - 3.4727}{.4343}\right)}{2739} = 1.73$$

At h = 1.5:

$$d = \frac{7239^{1.5}\left(\dfrac{2969^{1-1.5} - 5708^{1-1.5}}{1-1.5}\right)}{2739} = 2.30$$

Computed values for d for 1987 and 1988 using the same procedure are as follows:

		1987	1988
h = 1:	d	1.82	1.81
h = 1.5:	d	2.49	2.46

Substituting the values derived in the foregoing discussion to the SWR formula, the SWR estimates are presented below, in border prices (SWRb) and in domestic prices (SWRd). Conversion into domestic prices was made for comparison with the market wage and for use in social project evaluation. This is done by multiplying the estimates in border prices by 1/B (= SER/OER = 1.2 and 1.3). The SER provides a measure of the wedge between the border prices and domestic prices resulting from the protection structure and other government intervention.

Traditional method

SWRb = α z(L/N) SWRd = SWRb x 1/B

1986:

SWRb = (.803)(29.69)(1.287) = 30.68

1/B = 1.2:

SWRd = 30.68 x 1.2 = 36.82
SWRd/w = 36.82/57.08 = .64

1/B = 1.3:

SWRd = 30.68 x 1.3 = 39.88
SWRd/w = 39.88/57.08 = .70

1987:

SWRb = (.803)(32.43)(1.299) = 33.83

1/B = 1.2:

SWRd = 40.60
SWRd/w = 40.60/58.65 = .69

1/B = 1.3:

SWRd = 43.98
SWRd/w = 43.98/58.65 = .75

1988:

SWRb = (.803)(36.18)(1.283) = 37.27

1/B = 1.2:

SWRd = 44.72

SWRd/w = 44.72/69.33 = .65

1/B = 1.3:

SWRd = 48.45

SWRd/w = 48.45/69.33 = .70

Non-traditional Method

SWRb = α z(L/N) + B(w - z) (1-s_w) (SPS - d)

SWRd = SWRb x 1/B

1986:

At h = 1:

SWRb = (.803)(29.69)(1.287) + (1/1.2)(57.08-29.69)(1-0)(3.90-1.73)
= 80.20

1/B = 1.2:

SWRd = 96.24

SWRd/w = 1.69

1/B = 1.3:

SWRd = 104.26

SWRd/w = 1.83

At h = 1.5:

SWRb = (.803)(29.69)(1.287) + (1/1.2)(57.08-29.69)(1-0)(2.00-2.30)
= 23.84

1/B = 1.2:

SWRd = 28.60

1/B = 1.3:

SWRd = 30.99

SWRd/w = .54

1987:

At h = 1:

SWRb = (.803)(32.43)(1.299) + (1/1.2)(58.65-32.43)(1-0)(3.90-1.82)
= 79.28

```
        1/B = 1.2:
SWRd    = 95.13
SWRd/w  =  1.62

        1/B = 1.3:
SWRd    = 103.06
SWRd/w  =   1.76


At h = 1.5:

SWRb    = (.803)(32.43)(1.299) + (1/1.2)(58.65-32.43)(1-0)(2.00-2.49)
        =  23.12

        1/B = 1.2:
SWRd    =  27.75
SWRd/w  =    .47

        1/B = 1.3:
SWRd    =  30.06
SWRd/w  =    .51


1988:
-----
At h = 1:

SWRb    = (.803)(36.18)(1.283) + (1/1.2)(69.33-36.18)(1-0)(3.90-1.81)
        = 95.02

        1/B = 1.2:
SWRd    = 114.02
SWRd/w  =   1.64

        1/B = 1.3:
SWRd    = 123.52
SWRd/w  =   1.78

At h = 1.5:


SWRb   = (.803)(36.18)(1.283) + (1/1.2)(69.33-36.18)(1-0)(2.00-2.46)
       =  24.56

        1/B = 1.2:
SWRd    =  29.47
SWRd/w  =    .43

        1/B = 1.3:
SWRd    =  31.93
SWRd/w  =    .46
```

Note how drastically SWR fell with increased value of h. The most credible SWR estimate is derived when h is equal to 1.5. However, the corresponding i of 6.2 percent is low. Medalla and Power's estimate of i (10%) for their most plausible SWR result (41.78) was also considered low. Based on their discussion, the value of i can be raised further by adding a pure rate of time discount but this requires justification because it discriminates against future generations. Since the low discount rate favors capital intensive investment, it is important that the SPS should be used by increasing the initial investment cost in a project by the value of the premium if the new investments are at the expense of other investments, rather than at the expense of consumption. In this way, excessive capital intensity is discouraged.

	1986		1987		1988	
h	1	1.5	1	1.5	1	1.5
i	.041	.062	.041	.062	.041	.062
SPS	3.90	2.00	3.90	2.00	3.90	2.00
d	1.73	2.30	1.82	2.49	1.81	2.46
1/B = 1.2:						
SWRd/w	1.69	.50	1.62	.47	1.64	.43
1/B = 1.3:						
SWRd/w	1.83	.54	1.76	.51	1.78	.46

VI. STEPS AND PROCEDURES FOR ESTIMATING THE ACCOUNTING PRICE OF THE NONTRADABLES

A. *Concept*

A sector may be nontraded by the nature of its output such as education, transportation, health services and commerce. It is too costly to import such and economically viable to be produced in the country. This classification also includes sectors that are potentially tradable but actually nontraded because of trade barriers. The sector's participation in international trade may be limited by the government's trade policies such as quotas or prohibitive tariffs.

Nontraded commodities have a domestic supply, at a given level of local demand, below the c.i.f. price of imports but above the f.o.b. price of exports.

The general rule for the production of nontraded goods is that demand should be satisfied when the price charged, i.e. the accounting price, is set equal to the marginal social cost (MSC) after allowing for any tax.[9]

9. Little and Mirrlees, *Manual of Industrial Project Analysis in Developing Countries*, Volume II.

B. *Methodology*

One has to determine whether the increase in demand for the nontraded good as a consequence of the project will be satisfied by the decreased consumption elsewhere in the economy or by increased production. If the main source of supply increased domestic production, without a significant price increase, it is recommended that the accounting price be interpreted as the *marginal cost of increased production*. Alternatively, if the main source of supply reduced consumption elsewhere, with a significant price increase, it is recommended that the accounting price be interpreted as the *foregone marginal social benefit in consumption*.

If demand is met by increased production, decompose the production costs, step by step, into its constituent inputs and value each input at its accounting price. Some of these inputs will be traded commodities, primary factors and nontraded commodities. The traded elements can be directly evaluated in terms of border prices and the nontraded items further disaggregated.

The accounting price of a nontraded commodity is generally measured by the cost of supply, with all inputs valued at their accounting prices. The way indirect demand is usually brought into the analysis is by means of an input-output table, or by using a specially built semi input-output table. The input- output table will be the cornerstone of the empirical approach used in this study for estimating the accounting prices of goods and services.

The accounting price of the traded commodities and primary factors could be estimated by following the procedure discussed in the next section. The accounting price of the nontradables could be evaluated with further round of decomposition until eventually everything is decomposed into traded goods and primary factors. The number of desirable decomposition steps depends on the importance of the nontraded residual in the cost of the nontraded input. It is highly suggested in the literature that two or three decomposition processes are desirable. The overall conversion factor will be insensitive to any sub-item with small share in total costs. It is also useful to estimate averages for some of the major project cost categories, such as civil construction, transport and electric power. In this paper, only the major nontradable inputs to the manufacturing sector are included namely electricity, transport and communications. A convenient way to decompose the nontradables is through the use of the Input-Output table. The project utilized the I-O table for 1983. The procedures in estimating the accounting price of nontradables and the conversion factors using the I-O is discussed in the next section.

C. *Estimation Procedure*[10]

Step 1: Obtain the direct coefficients of the A, F, and D matrices from the transactions table of the I-O. A is the matrix of interindustry relationship, F is the matrix of nonproduced inputs and transfers and D is the matrix of the final demand. Particular interest is given in the input coefficients to the nontraded sectors (Tables 13a and 13b).

10. Taken from *Estimating Accounting Prices for Project Appraisal* by J. Keith Johnson.

Table 13a

Matrix of Direct Coefficients (66 x 66), 1983 Input-Output Table

Sector No.	Tradable Input	Electricity	Busline Operation	Road Freight Transport	Water Transport	Air Transport	Supporting Allied Services	Communications
A 12								
05	Banana	0.0	0.0	0.0	0.00002984	0.0	0.0	0.0
06	Other crops incl. agricultural services	0.0	0.0	0.0	0.00313955	0.0	0.0	0.0
09	Fishery	0.0	0.0	0.0	0.04268319	0.0	0.0	0.0
10	Forestry and Logging	0.00808007	0.0	0.0	0.0	0.0	0.0	0.0
12	Non-metallic mining and quarrying	0.0	0.0	0.0	0.00000179	0.0	0.0	0.0
13	Rice and corn milling	0.0	0.0	0.0	0.02056091	0.0	0.0	0.0
14	Sugar milling and refining	0.0	0.0	0.0	0.00107179	0.0030826	0.0	0.0
15	Milk and other dairy products	0.0	0.0	0.0	0.00077316	0.0068022	0.0	0.0
17	Refined cooking oil and margarine	0.0	0.0	0.0	0.00216580	0.0	0.0	0.0
18	Meat and meat products	0.0	0.0	0.0	0.05202109	0.0	0.0	0.0
19	Flour and other grain mill products	0.0	0.0	0.0	0.00187884	0.0	0.0	0.0
21	Other processed food	0.0	0.0	0.0	0.02396589	0.01103874	0.0	0.0
22	Beverage industries	0.0	0.0	0.0	0.00225263	0.03548654	0.0	0.0
25	Wearing apparel and footwear	0.00000943	0.0	0.0	0.00025330	0.0001769	0.00008868	0.00038834
26	Lumber, plywood and veneer	0.00005361	0.00411037	0.0	0.00	0.00	0.00	0.00
28	Furniture and fixture	0.0	0.0	0.0	0.00000358	0.00	0.0010017	0.00
29	Paper and paper products	0.0	0.00055819	0.00071591	0.00007561	0.00112601	0.00559646	0.00824335
30	Publishing and printing	0.00014020	0.00358040	0.00044722	0.00015840	0.00295234	0.00574519	0.01299875
32	Rubber and plastic products	0.000087107	0.05175980	0.02783920	0.00019116	0.01327126	0.01048956	0.00207728
33	Drugs and medicines	0.000059241	0.00010923	0.00003301	0.00001391	0.00101529	0.00030668	0.00091207
34	Basic industrial chemicals	0.000001975	0.00029614	0.00035044	0.00304173	0.00069796	0.00	0.00
36	Other chemical products	0.000200323	0.00144497	0.00063104	0.00025577	0.00175025	0.00414070	0.01003317
37	Petroleum products	0.515954900	0.284280500	0.21573959	0.19625308	0.10963186	0.04081632	0.01910058
38	Cement manufacture	0.000113728	0.0	0.00	0.00	0.00	0.00	0.00
39	Other non-metallic mineral products	0.00192292	0.00147396	0.00	0.00012340	0.00	0.00	0.00090286
40	Basic metal industries	0.000108316	0.0	0.00	0.00	0.00	0.00	0.00
41	Fabricated metal products	0.00742622	0.00807197	0.00259792	0.00	0.00	0.00	0.00
42	Machinery except electrical	0.000227676	0.0	0.00	0.00	0.00	0.00	0.00
43	Electrical Machinery	0.016855	0.0525395	0.04219110	0.00	0.00	0.00	0.00
44	Transport equipment	0.00001206	0.0562871	0.05911346	0.00	0.00	0.00	0.00
45	Miscellaneous manufactures incl. scrap	0.00002150	0.00029525	0.00006141	0.00	0.00	0.00	0.00
A 22								
47	Electricity	0.02339518	0.00544890	0.00594209	0.0030015	0.00122450	0.01526161	0.00895579
50	Busline Operation	0.00016075	0.00009567	0.00022065	0.0000175	0.00008258	0.00047581	0.00053600
52	Road freight transport	0.01263711	0.01022239	0.00344493	0.0091864	0.00606127	0.00468076	0.00553226
53	Water transport	0.00352814	0.00116162	0.00070323	0.0000000	0.00189328	0.00283880	0.00161089
54	Air transport	0.00003730	0.00003167	0.00002910	0.0000978	0.00036212	0.00042596	0.00039773
55	Supporting Allied Services to Transport	0.00203497	0.00026572	0.00013665	0.0112356	0.12770966	0.14022900	0.00806060
56	Communications	0.00001682	0.00032706	0.00146154	0.0004675	0.01066383	0.01769732	0.07053351
F 2								
73	Salaries and wages	0.10626129	0.21273522	0.25696936	0.24626430	0.15504259	0.31950670	0.29736312
74	Operating Surplus	0.21993871	0.22706709	0.29872905	0.28799641	0.35335956	0.28830374	0.38467734
	Depreciation	0.05491860	0.10297360	0.11913310	0.09264840	0.12099030	0.0554119	0.10278570
	Indirect Taxes net of subsidies	0.04249210	0.04191600	0.05553370	0.06551910	0.11434710	0.0440528	0.06608750
	Other value-added	0.01225278	0.08219720	0.1240920	0.12982870	0.11798670	0.1888389	0.21580390

Source: NEDA, Inter- industry Accounts of the Philippines, 1983 update.

Table 13b

Matrix of Direct Coefficients (66 x 66), 1983 Input-Output Table
(Residual Sector Coefficients)

Sector Number	Tradable Input	Electricity	Busline Operation	Road Freight Transport	Water Transport	Air Transport	Supporting Allied Services to Transport	Communications
A								
R								
2								
46	Construction	0.00072398	0.00079744	0.00021205	0.0000244	0.00	0.00053520	0.00204487
49	Waterworks	0.00018181	0.00032389	0.00011449	0.0000451	0.00070499	0.00093285	0.00057877
51	Other passenger land transport	0.00031332	0.00001102	0.00000668	0.0000325	0.00015814	0.00071048	0.00091264
57	Storage and warehousing	0.00002025	0.00000000	0.00000000	0.0000875	0.00000000	0.00000000	0.00000000
58	Wholesale and retail trade	0.06889408	0.06879477	0.07355787	0.0523096	0.03918297	0.01661460	0.03032639
59	Banks, non-banks and insurance	0.00051686	0.00079668	0.00129231	0.0009109	0.00478100	0.00727960	0.01413136
60	Real estate and ownership of a dwelling	0.00001840	0.00109928	0.00037398	0.0000267	0.00180470	0.01415947	0.00203106
62	Private education service	0.00000826	0.00000000	0.00000000	0.0000000	0.00039835	0.00000000	0.00112743
63	Private health services	0.00004636	0.00021276	0.00005435	0.0001203	0.00233723	0.00165013	0.00286125
64	Hotels and restaurants	0.00018584	0.00038598	0.00027043	0.0000754	0.08417893	0.02469339	0.00724268
65	Other private services	0.00986601	0.00340290	0.00673019	0.0101959	0.01438214	0.06594652	0.03837319
	Total Residual	0.08077517	0.07582472	0.08261235	0.0638283	0.14792845	0.13252224	0.09962964

Source: NEDA, Inter-industry Accounts of the Philippines, 1983 update.

Step 2 : The processing sectors in the A matrix are next classified as traded and nontraded. One could consult the latest two or three years trade statistics to aid in the classification. For the 127 x 127 matrix, sectors 1 to 96 were generally tradable and classified as importables, exportables and remaining sectors with equally substantial imports and exports, as mixed. Also included in this range are some potentially tradable items but actually not traded because of government policies. Sectors 97 to 127 are the nontradables.

Step 3 : Calculate the accounting price ratios for the traded sector using the following formulas:

Importable: $APR_m = \dfrac{1}{(1+t_m)\,(1+v_m)}$

where t_m = import tariff
v_m = indirect taxes (net of subsidies) levied at the point of entry

Exportable: $APR_x = \dfrac{1}{(1-t_x)\,(1+v_x)}$

where t_x = export tax
v_x = total indirect taxes (net of subsidies) levied on export sales

Mixed Sector: $APR_{MX} = w\dfrac{1}{(1+t_m)\,(1+v_m)} + (1-w)\dfrac{1}{(1-t_x)\,(1+v_x)}$

An alternative to the above formulas is resorting to the use of implicit tariffs. The implicit tariff for a sector is the proportional difference between the domestic price and border price of a set of commodities:

$$T = \frac{\text{domestic price}}{\text{border price}} - 1$$

Implicit tariffs could be computed either by using direct price comparisons or using legal tariffs and taxes. The ratio of the domestic price of a product to its border price (Pd/Pb - 1), were computed for those sectors identified as having substantial Non- Tariff Measure (NTM) coverage. Price ratios were used only for those years when a sector was still restricted by NTMs. Otherwise, legal tariffs and taxes were used to compute the implicit tariffs.

For exportables,

$T_J = -t_x$ where T_J is the implicit tariff on the output

t_x is the export tax; the negative sign implies negative protection

It should be noted that the sales tax factor was netted out. In 1986, the sales tax on domestic manufactures equalled the advance sales tax on imported goods. Thus, the protection from sales tax, which is in effect provide an incentive to export, is removed.

For the importable sectors, one must derive a representative tariff rate per sector where rates of duties are widely differing. Get the highest and lowest tariff rates per sector, calculate two implicit tariffs based on said rates to get a high and low estimates for implicit tariffs and take the average of the two estimates. Two weights were used in averaging. One weight is the import level in the 1983 I-O table which is applied to the low implicit tariff estimate. The other weight is the output level which has to be deflated by the high implicit tariff estimate to put it in free trade terms.

$$\text{High Implicit Tariff: } TH = (1 + th)\ (1 + f) - 1$$

$$\text{Low Implicit Tariff: } TL = (1 + tl)\ (1 + f) - 1$$

where th is the highest tariff rate for the sector
tl is the lowest tariff rate for the sector
f is the representative advance sales tax rate for the sector

For the mixed sector:

$$TA = \frac{TH \dfrac{wQm}{1 + TH_{1983}} + TL\ (M) + (-tx) \dfrac{wQx - X}{1 - tx}}{\dfrac{wQm}{1 + TH_{1983}} + M + \dfrac{wQx - x}{1 - tx}}$$

where TA is the average implicit tariff
TH is the high implicit tariff
w is the weight of output based on sector's demand elasticity
Qm is the importable output, Qm = Q - Qx
TH_{1983} is the high implicit tariff in 1983
TL is the low implicit tariff
M is the value of imports in 1983 I-O table
tx is the export tax
Qx is the exportable output, Qx = 3x
x is the value of exports in 1983 I - O table

Step 4 : To aggregate a 127 x 127 matrix to a 66 x 66 matrix, one must use free trade value added (FTVA) and output (Q) of each sector i in the 127 x 127 matrix as weights (w).

$$w_i = FTVA \times Q_i$$

The implicit tariff (T) for the traded sectors of the 66 x 66 matrix is computed by taking the sum of the weighted implicit tariffs of the sub-sectors (ti). This is provided in Table 14.

$$T = \frac{FTVA \times Q_i \times t_i}{FTVA_i \times Q_i}$$

The correlation between the 127 sector classification and the 66 sector classification is provided in the I-O publication.

Since by definition, t_i is the proportional difference between the domestic price and the border price, one has to reverse the ratio to 1/T to get the accounting price ratios (APR) for each traded sector. The APR is obtained directly from the average percentage divergence of their CIF of FOB prices from their domestic prices. The computed APR is also the conversion factor for each traded inputs (Table 15).

Step 5 : Calculate the APRs for the nontraded sectors. Their APRs are the sum of all the traded and nontraded material inputs and factors. The demand for traded inputs per unit of nontraded output is given by the A_{12} matrix, while the need for the nontraded inputs per unit nontraded output is provided by the A matrix. The global demand for each type of input per unit of nontraded output is obtained by adjusting each item by the Leontief inverse of the A_{22} matrix, $(I-A_{22})^{-1}$ as in Table 16, so that:

$$P_2 = P_1 \; A_{12} \; (I - A_{22})^{-1} + P_f \, F_2 \; (I - A_{22})^{-1}$$

where P_2 is the accounting price ratio of nontraded goods
P_1 is the accounting price ratio of the traded inputs
A_{12} is the matrix of coefficients for traded inputs used to produce nontraded output
A_{22} is the matrix of coefficients for nontraded inputs needed to produce nontraded output
P_f is the shadow price of the primary factors
F_2 is the matrix of the coefficients of nonproduced input purchases and transfer payments per unit of nontraded output

In the 1983 I-O, the factors enumerated are just salaries and wages, and operating surplus. Operating surplus include depreciation and indirect taxes net of subsidies. To get the breakdown of operating surplus, one could use the proportion of each item to the total operating surplus based on the 1979 I-O. Apply this proportion to the total operating surplus of the 1983 I-O to estimate the value of depreciation and indirect taxes. These values are divided by the total for each nontraded sector to estimate the coefficients for these factors.

The only variable unknown at this point is P_f. The APR for wages and salaries is the ratio of the opportunity cost of using labor valued in accounting prices to the average market wages paid in the relevant nontraded sector. Labor has an APR equal to the Labor Conversion Factor (LCF). Depreciation is converted to accounting price by the Investment Conversion Factor (ICF). The APR for indirect taxes is zero since it is a form of transfer payment which do not represent a claim on real resources. If there are available estimates for APR of labor and capital, these can be used for the first round estimation of the APR of the nontraded goods. Another alternative is to use dummy values for the unknown parameters.

The final values of the traded sector APR are obtained in one iteration since there are no nontraded components in the traded sector APRs. To obtain a converged solution for the nontraded APRs, calculate a first-round estimate for each conversion factor and substitute the values for the dummy used earlier, and solve the system again.

D. *Results*

Table 14 provide the computed accounting price ratios of the tradable inputs to the nontradable outputs.

For the first-round estimation, the APR for labor (LCF) and other value added is taken to be the inverse of SER/OER (the middle value of around 1.25 for SER/OER is chosen). The ICF used is 1/1.15, based on an average tariff rate for capital imports. The project computed SWR for 1986-88 at an average of around 70 percent (using different assumptions). Assuming roughly that 20 percent of the wage component belong to unskilled category, 20 percent is then also adjusted by 70 percent. (This is on top of the LCF adjustment. The overall adjustment for labor is around .752) .752).

Plugging the values of the estimated APRs for the tradable inputs and primary factors to the equation:

$$P_2 = P_1 \ A_{12} \ (I-A_{22})^{-1} + P_f \ F_2 \ (I-A_{22})^{-1}$$

The first-round estimates of the accounting price ratios for the major non-tradables (P_2) used in the manufacturing sector are shown below.[11]

These values will be fed back to the equation to obtain the estimates of conversion factors for the primary factors. This process is repeated iteratively until convergence occurs.

	1986	1988
Electricity	.6908	.6908
Busline Operation	.7592	.7604
Road, Freight, Transport	.7490	.7496
Water Transport	.7230	.7205
Air Transport	.6871	.6875
Supporting Allied Services and Transport	.7222	.7224
Communications	.6671	.6672

11. In the actual computation, the residual sectors' coefficients (A_{R2} in Table 13b) were added columnwise. The resulting sums were then added as a last row in A_{12}. The APR used is the inverse of SER/OER (middle value of 1/1.25). The residual sectors are other non-traded sectors whose traded inputs are not considered important. Lumping them altogether and using the inverse of SER/OER as a standard conversion factor is merely a means of simplification.

Table 14

Average Implicit Tariffs, Output, and Free Trade Value-Added of the Traded Sectors, (127 x 127)

Sector Number	Classification	Average Implicit Tariff 1986	1988	Output (Q) 1983	Free Trade Value Added 1983
03	PM	0.200	0.200	5,079,100	0.8999
04	PX	0.000	0.000	6,557,700	0.8526
06	PX	0.000	0.000	3,348,500	0.8139
07	PX	0.000	0.000	6,159,600	0.8948
08	PM	0.2953	0.2953	7,083,400	0.9493
10	MW	0.2663	0.2663	292,600	0.7950
11	MW	0.0296	0.0296	1,328,300	0.9502
12	PX	0.0000	0.0000	2,532,400	0.8880
13	PM	0.1426	0.1426	1,666,700	0.8781
19	MW	0.0260	0.0389	8,486,500	0.8000
20	MW	0.0653	0.0653	13,059,200	0.9328
21	PX	-0.2000	-0.2000	8,652,700	0.8606
22	PM	0.4072	0.4072	561,900	0.9847
23	PX	0.0000	0.0000	4,278,400	0.7963
24	PX	0.0000	0.0000	2,647,000	0.7717
25	PX	0.0000	0.0000	589,100	0.7630
26	PM	0.1924	0.1924	1,672,100	0.8637
27	PM	0.1027	0.1027	833,100	0.7602
28	PM	0.2500	0.2200	26.278,800	0.9042
29	PX	0.0000	0.0000	6,347,400	0.9428
30	PM	0.1704	0.1704	3,011,200	0.5269
31	PM	0.3317	0.3317	1,410,700	0.5350
32	PX	0.0000	0.0000	12,679,800	0.3841
33	PM	0.4944	0.4944	7,271,000	0.3316
34	PM	0.4962	0.4962	17,827,000	0.9952
35	PM	0.4998	0.4998	2,004,800	0.6717
36	PM	0.2951	0.2951	6,934,400	0.2978
37	MW	0.2864	0.2864	6,869,200	0.4105
38	MW	0.0660	0.0660	3,240,600	0.3227
39	MW	0.1013	0.1013	6,313,600	0.3683
40	MW	0.4615	0.4615	6,818,000	0.4405
41	MW	0.3406	0.3406	3,110,000	0.3066
42	MW	0.4862	0.4862	2,460,900	0.3387
43	PX	0.0000	0.0000	1,723,600	0.6015
45	MW	0.4052	0.4052	3,469,700	0.6528
46	PM	0.5000	0.5000	1,608,700	0.5347
47	MW	0.0310	0.0310	2,057,600	0.5968
49	PM	0.5000	0.5000	6,120,000	0.4893
50	PX	0.0000	0.0000	1,869,500	0.6032
51	PM	0.3274	0.3274	9,485,900	0.4234
52	MW	0.3771	0.3771	3,116,400	0.4474
53	MW	0.1495	0.1495	1,893,900	0.4353
54	PX	0.0000	0.0000	10,671,200	0.4897
55	PX	0.0000	0.0000	1,809,400	0.5033
56	PX	0.0000	0.0000	6,314,600	0.3578
57	PX	0.0000	0.0000	4,237,700	0.3914

(Table 14 continued)

58	PX	0.0000	0.0000	1.416.600	0.4534
59	PM	0.2882	0.2882	1.451,700	0.5112
60	PM	0.4000	0.4000	2.121.100	0.3153
61	PM	0.4492	0.4492	2.250.200	0.4254
62	MW	0.1817	0.1817	549.500	0.2700
63	PM	0.4842	0.3000	2.320.700	0.3529
64	PM	0.5000	0.5000	574.500	0.3115
65	PM	0.3530	0.3530	424,000	0.3844
66	MW	0.4356	0.4356	5.135.100	0.3543
67	PM	0.1834	0.1834	4.551,500	0.4777
68	PM	0.1708	0.1708	2.765,500	0.5180
69	PM	0.1575	0.1575	1,690,600	0.4228
70	PM	0.2267	0.2267	1,227,800	0.3900
71	PM	0.4433	0.4433	848.900	0.4629
72	PM	0.3601	0.3601	1.936.200	0.5208
73	PM	0.4914	0.4914	2.697.200	0.3823
74	PM	0.5000	0.5000	590.700	0.4517
75	PM	0.3308	0.3308	1,224,300	0.4487
76	PM	0.1916	0.1916	38,884,400	0.4704
77	MW	0.3784	0.3784	3.512,700	0.4307
78	PM	0.4555	0.4555	2,144,400	0.5066
79	MW	0.3266	0.3266	1.690.100	0.5272
80	PM	0.1669	0.1669	10,324,200	0.3174
81	MW	0.1660	0.1660	315.200	0.4032
82	PM	0.3858	0.3858	7,214,100	0.3648
83	PM	0.1903	0.1903	9.291,700	0.4725
84	PM	0.1311	0.1311	638,100	0.4320
85	PM	0.4530	0.4530	2.639,900	0.4389
86	PM	0.4886	0.4886	1,998,900	0.4050
87	PM	0.2164	0.2164	975,400	0.5068
88	PX	0.0000	0.0000	3.665.600	0.5003
89	PM	0.1933	0.1933	2.011,000	0.5193
90	PM	0.3328	0.3328	2,661.500	0.4158
91	PM	0.2092	0.2092	1,723,100	0.5995
92	PX	0.0000	0.0000	1.170.300	0.4366
93	PM	0.4842	0.4842	170.200	0.3007
94	PM	0.4303	0.4303	309.300	0.4456
95	PM	0.2831	0.2831	430,400	0.3614
96	PM	0.2875	0.2875	3,034,200	0.4938

Source: Tariff Commission

Table 15

Accounting Price Ratios for Tradable Inputs to Nontradable Output

Sector No.	Sector Name	Classification	1986	1988
05	Banana	PX	1.0000	1.0000
06	Other crops including agricultural services	MW	0.8838	0.8838
09	Fishery	MW	0.9513	0.9471
10	Forestry and Logging	MW	1.1877	1.1877
12	Non-metallic mining and quarrying	PM	0.8583	0.8583
13	Rice and corn milling	PM	0.8000	0.8197
14	Sugar milling and refining	PX	1.0000	1.0000
15	Milk and other dairy products	PM	0.8181	0.8181
17	Refined cooking oil and margarine	PM	0.6692	0.6692
18	Meat and meat products	PM	0.6682	0.6682
19	Flour and other grain mill products	PM	0.7721	0.7721
21	Other processed food	MW	0.7745	0.7745
22	Beverage industries	MW	0.8169	0.8169
25	Wearing Apparel and footwear	PX	1.0000	1.0000
26	Lumber, plywood, and veneer	PX	1.0000	1.0000
28	Furniture and fixtures	MW	0.9578	0.9578
29	Paper and paper products	PM	0.7456	0.7456
30	Publishing and printing	PM	0.6900	0.6900
32	Rubber and plastic products	MW	0.7054	0.7278
33	Drugs and medicines	PM	0.8450	0.8450
34	Basic industrial chemicals	PM	0.8541	0.8541
36	Other chemical products	PM	0.7050	0.7050
37	Petroleum products	PM	0.8392	0.8392
38	Cement manufacture	MW	0.7255	0.7255
39	Other non-metallic mineral products	MW	0.7156	0.7156
40	Basic metal industries	MW	0.8570	0.8570
41	Fabricated metal products	PM	0.7216	0.7216
42	Machinery except electrical	PM	0.8401	0.8401
43	Electrical machinery	MW	0.7493	0.7493
44	Transport equipment	PM	0.7855	0.7855
45	Misc. manufactures including scrap	PM	0.7704	0.7704

Table 16

Inverse Coefficients $(I-A_{22})^{-1}$

Nontradable Output / Nontradable Input	Electricity	Busline Operation	Road Freight Transport	Water Transport	Air Transport	Supporting Allied Services to Transport	Communications
Electricity	1.03829	0.02296	0.01932	0.01332	0.01887	0.02873	0.02148
Busline Operation	0.00069	1.00071	0.00074	0.00041	0.00051	0.00085	0.00053
Road Freight Transport	0.03207	0.02656	1.01617	0.02061	0.01628	0.01122	0.01217
Water Transport	0.00795	0.00775	0.00644	1.00324	0.00483	0.00526	0.00444
Air Transport	0.00107	0.00100	0.00087	0.00075	1.00127	0.00139	0.00115
Supporting Allied Services to Transport	0.00551	0.00263	0.00201	0.01499	0.15091	1.16475	0.01115
Communications	0.00553	0.00529	0.00590	0.00425	0.01850	0.02612	1.07964

Source: NEDA, The Inter-industry Accounts of the Philippines, 1983 update.

BIBLIOGRAPHY

Bautista, Romeo, J. Power et al. *Industrial Promotion Policies in the Philippines.* Makati: Philippine Institute for Development Studies, 1979.

Boadway, Robin. "The Welfare Foundations of Cost-Benefit Analysis." *Economic Journal* 84, no. 36 (December 1974).

________________. "A Note on the Treatment of Foreign Exchange in Project Evaluation.' *Economica* 45, no. 180 (November 1978).

Dasgupta, Partha, S. Marglin, and A. Sen. *Guidelines for Project Evaluation.* New York: UNIDO, 1972.

Harberger, Arnold C. "Survey of Literature on Cost-Benefit Analysis for Industrial Project Evaluation," Chapter 2; "On Measuring the Social Opportunity Cost for Public Funds,' Chapter 4; "On Estimating the Rate of Return to Capital in Colombia," Chapter 6; "On Measuring the Social Opportunity Cost of Labor," Chapter 7; "Cost-Benefit Analysis c Transportation Projects," Chapter 10. *Project Evaluation: Collected Papers.* Chicago: University of Chicago Press, 1976.

Little, Ian and J. Mirrlees. *Manual of Industrial Project Analysis in Developing Countries.* Vol. 2. Paris: OECD Development Center, 1968.

__________________. *Project Appraisal and Planning for Developing Countries.* New Yo Basic Books, 1974.

Medalla, Erlinda M. "Derived Protection for Nontraded Primary Product." PIDS Staff Pape Series No. 84-05. Makati: Philippine Institute for Development Studies, 1984.

__________________ and J. H. Power. "Methodology for Measuring Protection and Comparative Advantage." PIDS Staff Paper Series No. 85-04. Makati: Philippine Institute for Development Studies, 1985.

Mishan, Edward J. *Cost-Benefit Analysis.* London: Allen and Unwin, 1975.

National Census and Statistics Office (NCSO). Annual Survey of Establishments. Manila: NCSO, n.d.

___________________. Census of Establishments. Manila: NCSO, n.d.

___________________. Special Releases. Manila: NCSO, n.d.

National Statistical Coordination Board (NSCB) and NCSO. *The Inter-industry Accounts of the Philippines: 1983 Update*. Manila: National Statistics Office, 1983.

National Statistical Coordination Board (NSCB). *Philippine Statistical Yearbook*. Makati: NSCB, n.d.

Parial, Louie. "Estimating the Effective Protection Rate: Methodology." Tariff Commission - PIDS Joint Research Paper. Forthcoming.

Johnson, J. Keith. "Estimating Accounting Prices for Project Appraisal." Asian Development Bank (Economics Office). Draft working paper. Unpublished, March 1987.

Ray, Anandarup. *Cost-Benefit Analysis: Issues and Methodologies* (WB Publication). Baltimore, Maryland: Johns Hopkins University Press, 1984.

Sen, Amartya K. "Isolation, Assurance and the Social Rate of Discount." *Quarterly Journal of Economics* 81, no. 1 (February 1963).

Squire, Lyn and Herman G. van der Tak. *Economic Analysis of Projects*. Baltimore, Maryland: Johns Hopkins University Press, 1975.

Tariff Commission. *Tariff and Customs Code of the Philippines*. Quezon City: Tariff Commission, 1988.

Balassa, B. and Associates, *Structure of Protection in Developing Countries*. Baltimore: Johns Hopkins University Press, 1971.

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